AUGUST 1, 1930

ELECTRICAL WEST

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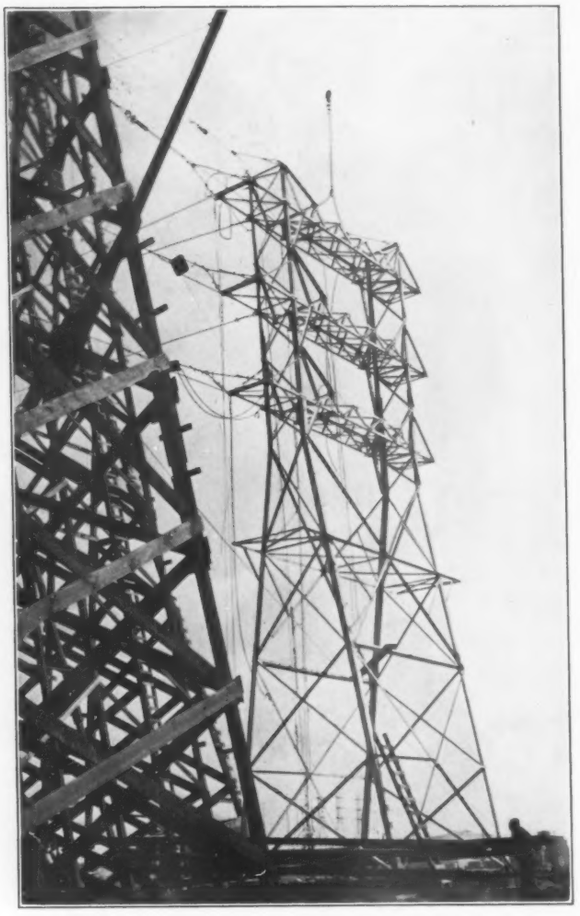

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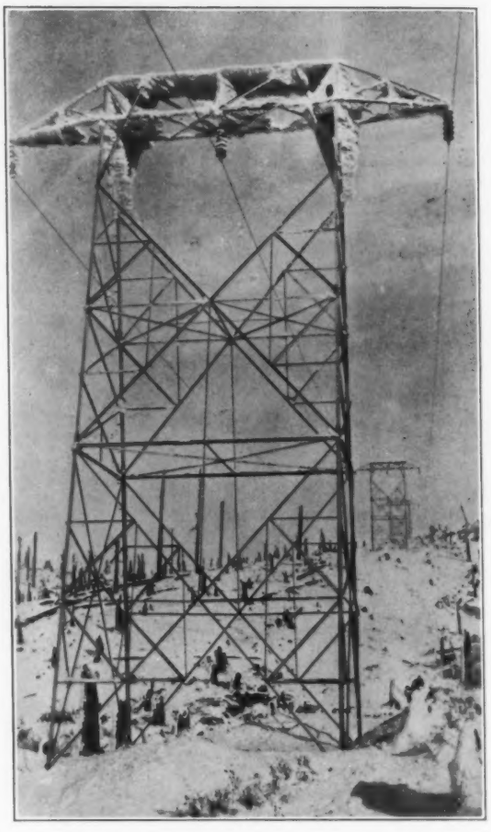

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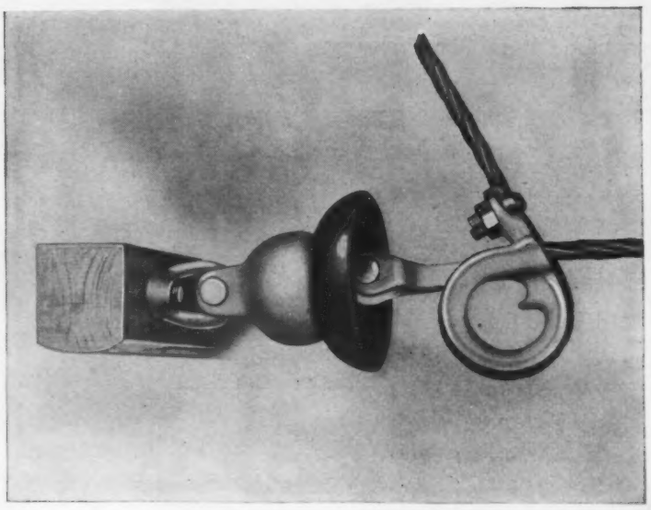
New!



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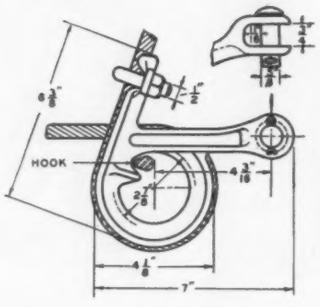

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ELECTRICAL WEST

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G. C. TENNEY, *Editor*

The Month

IF SIMPLICITY is the essence of beauty, the new Shell Oil Company Building in San Francisco is a work of art, since it not only breaks new ground in electrical installation practice by the adoption of the simple efficiency of outdoor substation design to an interior wiring system, but it also provides greater adequacy, flexibility and economy in doing so.

▼ ▼ ▼

ONLY by bringing all facts out in the open for serious consideration can the perplexing problems of dealer and central station merchandising relations be given the broader understanding on both sides which is necessary for their solution. The subject at this moment is one of the livest commercial problems facing the industry.

▼ ▼ ▼

WHAT will natural gas conservation do to the commercial and engineering development of the electrical industry? A survey of the situation at the present time presents pertinent facts and suggests important tendencies.

▼ ▼ ▼

PACIFIC Gas and Electric Company, through purchase of control of the San Joaquin Light & Power Corporation and Great Western Power Company, has stepped into fourth place in the electric utility field of the United States. The combined Pacific Gas-Great Western-San Joaquin system is only exceeded in plant capacity, peak load and net generated output by the Niagara-Hudson Power Corporation system, the New York Edison system and the Commonwealth Edison system. The new California system comprises 16 steam-electric and 46 hydro-electric generating plants.

"MOST significant step yet taken by this country in the conquest of the desert," Secretary Wilbur calls the Boulder Dam project in advising the contractors for power that construction has commenced. Founding of a new city, building a railroad and highway, construction power supply and initial work on the four 50-ft. diversion tunnels are covered in the $10,660,000 appropriated by Congress. Dam, power houses, transmission lines, All-American Canal and water supply system for southern California will cost almost $500,000,000—a record construction project. The burning question now is, What will be the result of Arizona's definitely promised litigation?

▼ ▼ ▼

STEAM plants versus hydro plants—an economic conflict recently brought prominently into public discussion—proves to be a subject as old as the history of electric power production. It just so happens that in the changing order of affairs, the importance of steam plants in the West has grown so greatly and so rapidly that there is a tendency to look upon it as something new. The imminence of equality in generating capacity between steam and hydro plants on Western systems is merely an answer to the demands of changing economic conditions.

Editorial

As an Aid to Assimilation

MODERN tempo in business and engineering demands from the publisher a new type of publication. Leisurely perusal may still be the lot of a magazine of fiction, but the business magazine must be engineered to serve business quickly, accurately, and thoroughly during the rush of business hours. To give the fullest usefulness, its contents must amass the facts pertinent to those phases of the business it covers in the manner and under the groupings which will make them most easily assimilable.

As a definite step toward this end ELECTRICAL WEST with this number begins a new grouping of its contents. The arrangement is designed to serve the eleven Western states to best advantage, embracing as it does the wide diversity of interests and branches of endeavor. The scope and variety of this field, by this simple matter of arrangement, is realized in a surprising degree not before appreciable.

A more intensive usefulness, a greater efficiency to the reader were the aims of the editors in the development of this method of presentation. Yet, strangely enough, the method has brought a new variety and a sweep of interest hitherto unrealized in the wide diversity of electrical progress in the West.

Another Crop of Anti-Utility Legislation

CLOUDS darken the political horizon in several Western states as fall elections draw near. San Francisco will vote upon a bond issue of $68,115,000 for the purchase of the electric distribution system within its city limits. Oregon's principal contender for the gubernatorial chair is a candidate whose platform includes planks favoring state and municipal ownership of electric utilities and modification of the regulatory system. Washington voters are faced with a district power bill which is only a slight modification of the public ownership measures that have appeared on the ballot in that state since 1924. In other states and municipalities there are measures aimed at the electric light and power companies.

Although backed by extremists or misguided political groups and fomented by misunderstanding or imagined evils in the economic system that demands that utility service be rendered by monopolies, the present crop of inimical legislation is proof that the public relations problem of the power companies is far from solved. While it is true that no amount of sane argument will change the attitude of that small group in whose breasts springs the eternal hope that some day the electorate will vote affirmatively on such legislation as this group fosters, the fact remains that the public at large is slightly skeptical of the interest and intentions of the power industry.

Probably the same arguments that have defeated such proposed legislation in the past will defeat this new crop. One might hazard the opinion, however, that the public generally is beginning to look with suspicion upon the defensive attitude of the utilities. The time has arrived for frank answers to criticisms, for specific reasons for being in the business of producing and distributing electrical energy, and finally, for more information about the value of electrical service under the present system of ownership and operation and the cheapness of electricity in comparison with other present-day commodities.

"Canned" Gas Competition

"CANNED" gas competition is the newest topic of discussion whenever two or more commercial department men meet. What it is and its possible effect on sales of electric appliances and electric energy are discussed elsewhere in this issue. The salient points are these: Developments in the natural gas and oil industry have produced two new products, butane and propane, which have a reasonably wide application as fuels. Oil and gas companies are organized to extend this service into territories hitherto served exclusively with electricity. Large numbers of consumers formerly prospects only for electric power to replace present cooking and water heating equip-

ment, are now to be given a choice between gas and electricity.

That, briefly, is the problem the power companies and the dealers in electrical appliances are facing.

The solution appears almost self-evident. In the first place, sales effort must be keyed to a higher pitch in line with the merchandising methods being employed in selling this new gas service. One company has already demonstrated that this is possible by conducting a successful range campaign in a community where butane service is to be made available. A real solution lies in the group appliance sales program. With it, instead of merely being sold electric service for lights and small appliances, the home is equipped at one time with refrigeration, electric cooking, electric water heating, and possibly electric air heating as well. Thus no point of entry is left for the gas man and his service.

To meet this competition successfully requires immediate action. There is no time for analysis, debate and discussion. The power companies have the advantage, in most cases, of being already on the consumer's premises with their service. If they fail to capitalize this advantage, then they deserve little sympathy if the gas man sells a range and water heater, while they stand by inactive and complacent.

Keep the Slack Tightened Up

WHEN the old gray mare trotted along nicely on a level road there was a good deal of slack on the tugs and the reins lay idly over the dashboard. It was when one came to a rise that the slack was jerked taut and the reins were given a meaningful ripple. There was no slack on the hard uphill pull.

Business has a way of letting out on the slack of credit and letting the reins of economic discipline lie idly over the dashboard when everything is trotting along nicely on level roads. It has a way of pulling up with a jerk as the slack must be taken in for the uphill pull, of using the reins as something of a whip to force collections. Unfortunately, very little has been done to keep the tugs taut when the hard climbing has been accomplished.

Much of the tightening up of credit slack made necessary at this time, much of the economic discipline which will have pulled those who survive the "hard times" through the crisis, will be relaxed when the next rise is topped if the lessons of the past few months are not well learned. The National Association of Credit Men issues this warning:

"When the tide turns, in two months, or three months or six months, credit managers will do well to see that these weak accounts are not replaced by others of their kind. They might well resolve now that the slack which has been taken up during the recent dark days shall not be lost, that the discipline developed in the observance of terms shall be maintained, and that credit standards shall be kept high, when business resumes its interrupted upward course."

The wholesaler with his dealers, the dealers with their installment accounts and wiring customers, the central stations with their merchandise customers, in fact all sellers in their relations with all buyers can prevent uneconomical inflation in the new period which must come after the air is squeezed out of the past years' credit structure. Volume-mad plunging at somebody else's expense and on someone else's money should not be made possible again by lax credit terms.

Business Enters Into Higher Education

AN ANSWER to some of the complaints of industry against modern institutions of higher learning is seen in the appointment of Dr. Leonard F. Fuller, executive vice-president of the Federal Telegraph Company, as leading professor of electrical engineering at the University of California. If this appointment is indicative of a trend toward the strengthening of educational staffs through the injection of new blood in the persons of men and women who have been time-tested in the crucible of modern business, then it deserves every encouragement.

There are instances where sight has been lost of the purpose of higher institutions of learning, namely, to give to their students a foundation upon which can be built a chosen career and a constructive place in society. Business and industry today demand more than the machine-stamped university graduate of the past. Men and women are wanted who have an insight into the business or profession they have chosen, who have the ability to interpret history as it affects their work, and who see the practical application of theoretical knowledge. The best qualified person to give this instruction is a man whose practical experience has placed him at the top of his profession.

The Industry

Gas Competition

Standard Oil Company's well No. 8-IP in Kettleman Hills with a large daily natural gas output

SURVEYING latest developments in the gas and oil industry, ELECTRICAL WEST presents observations on oil and gas conservation, natural gas, "canned" gas and liquid gas, with particular reference to their competitive relationship to electric power

WHAT effect will recent developments in the natural gas industry have upon the electric light and power industry? What competition may power company commercial departments expect from natural gas, and propane and butane, two of its byproducts? Answers to these questions depend upon the electrical industry itself. To arrive at any answer requires a study of the situation as it exists today. ELECTRICAL WEST presents in this article the results of a survey of gas developments in the far Western states, particularly as they apply to the two questions that have been raised.

Natural gas has been distributed in southern California communities for many years. Within the past two years it has been brought into northern California from the San Joaquin Valley fields, into Salt Lake City from Wyoming, and into Denver and other Colorado cities from the Texas panhandle. Active development of and widespread interest in natural gas have been brought about within the past twelve months, and in so far as propane and butane are concerned, within the last six months.

Major interest on the Pacific Coast dates from the passage of the gas conservation law by California and the subsequent efforts to enforce this legislation. This measure prohibits unreasonable waste of natural gas. Prior to its passage oil producers in the state had been permitting upwards of 30,000 million cubic feet of natural gas per month to blow to atmosphere in the course of oil production. This wasted natural resource, in terms of energy, may be more easily comprehended when it is realized that it is the equivalent of the output of a 6,500,000-kw. power plant operating at 70 per cent load factor, which is slightly more than four times the aggregate peak load of all California electric utilities.

With oil production contingent upon reasonable use of gas and restriction of waste, oil operators have been faced with a problem of marketing or otherwise disposing of the byproduct gas from wells. An injunction has been obtained against operators in the Santa Fe Springs field in southern California, a restraining order issued by the courts and the entire question of gas conservation, including the constitutionality of the new law, placed in litigation. The legal fight has not been settled. Since the law is fundamentally and economically sound, there is a general opinion that it will be upheld and enforced.

To date, conservation has not been successful because of the unsettled legal situation. Net production of natural gas in California during May was 46,534 million cubic feet, of which 21,168 million cubic feet was wasted. Of the total May production, Kettleman Hills, in the San Joaquin Valley, produced 14,338 million feet with a wastage of 11,686 million feet.

If, however, the law is upheld, a reasonable use must be found for the gas now wasted. Thus the oil companies become vitally interested in the problem. To produce oil, the companies must dispose of their gas. Several avenues of disposal are open. The gas may be sold to existing gas utilities, it may be sold to electric utilities for fuel for steam plants, it may be burned under boilers in the oil fields or otherwise utilized in the production of oil, or it may be pumped back into the ground for repressuring old fields.

Present natural gas consumption in California ranges between 9,000 million cubic feet per month in summer to 15,000 million cubic feet per month during the winter at the peak of the heating load. Electric utilities are burning in existing steam plants, or will burn in plants now under construction, 4,500 million feet per month. Repressuring of old fields will absorb at present a maximum of 1,500 million feet per month. Repressuring is limited by the back pressure built up in the field, which soon mounts to a point where pumping and compressor operating costs prohibit further ground storage.

Average oil production in California at present is approximately 700,000 bbl. per day with a daily consumption of 630,000 bbl. Gas production in terms of cubic feet per barrel ranges from a maximum of 20,000 for Kettleman Hills wells to an average of 2,500 for the rest of the state. Gas production from existing wells in southern California fields is diminishing. However, experts are of the opinion that supplemental reservoirs exist in deeper oil sands that have not yet been tapped. Kettleman Hills output is increasing as more wells come into production. The possible supply of gas from Kettleman Hills has not been estimated, but geologists believe

that this one area can supply ample gas to meet the entire needs of the state for generations to come.

So much for the background upon which to base conclusions regarding natural gas. From the standpoint of the electrical industry, its extensive distribution and use offers competition on the one hand and advantages on the other. Increasing steam plant efficiencies, plus an adequate supply of gas for fuel, has set a definite trend toward steam-electric stations as a source of base load supply. Costs of steam generated energy are already lower than hydro generated energy. If there should be a further reduction in gas prices and further increases in efficiency, this difference will be even more marked. Moreover, this abundant supply of cheap fuel for industry has already attracted many new industrial plants to the areas where gas is available. It has been stated that California is on the verge of a new industrial era for this reason. Naturally the electric utilities will benefit from this industrial growth, both in the load that these plants will add to their lines and in the demands of the population increment that they will bring about.

As for competition, electricity has been and is being sold in competition with natural gas in southern California for all types of industrial service. There has been a marked increase in the amount of industrial heating load, and in oil field load where wells are being both drilled and pumped electrically despite available gas supplies. In the domestic field, electric cooking, water heating and air heating are being sold in competition with natural gas, and the same applies for commercial heating and cooking.

One of the fleet of salesmen's demonstration cars employed in marketing "Flamo"

Efforts of the gas companies to replace electric motors with gas engines have so far been fruitless. Superiority and dependability of service of electric power constitute a sales resistance that the gas engine people have not been able to break down. Some new gas engine installations have been made, but the number is but a fractional part of the total new electric load of this character.

Gas rates range from the minimum industrial rate of 11 cents per thousand cubic feet for surplus gas, with a shut-off clause in the contract, and an average of 17 cents for ordinary industrial purposes, to an average of 80 to 85 cents for domestic uses. The minimum domestic rate for house heating where consumption is large is 50 cents. The maximum domestic rate is in suburban districts of communities where gas service is being made available for the first time; here the rate reaches $1.30 per thousand feet. These rates are for 1,100 B.t.u. gas.

Future developments in the field of natural gas promise to be interesting. If conservation is enforced, then oil producers not now so fortunately situated as some of the larger oil companies that are selling their gas output to the gas utilities, must seek an outlet for byproduct gas. If this gas must be disposed of as oil is produced, then there is a likelihood that a highly competitive situation may develop. If this happens, the electrical industry may expect competition of a distinctly new and serious character.

Sharper competition will probably develop from some of the newer developments in the oil and natural gas industries. In the production of gasoline from natural gas and in the compression of natural gas for transmission there is being produced a series of hydro-carbons known as "canned" gas or "bottle" gas.

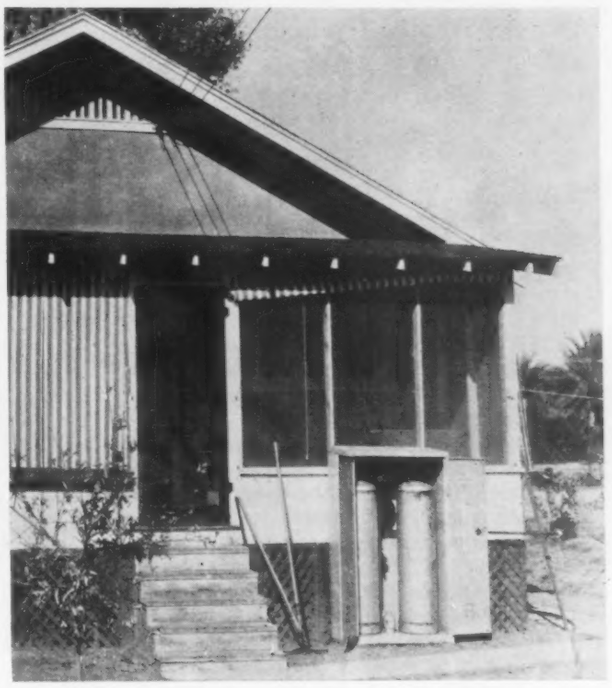
In processing natural gas as it emerges from the wells there are obtained hydro-carbons that include methane, ethane, propane, iso-butane, butane, pentane and hexane. Methane and ethane are the natural gas that is sent into the pipelines; pentane and hexane form natural gasoline. Propane and butane are the byproducts that are marketed as "canned" gas.

The ease with which they can be liquefied and transported as liquids at relatively low pressures gives them particular commercial significance. Physical characteristics of these two gases are given in Table I. Each, because of slight differences in these characteristics, has different applications, and each must be dealt with separately.

The "canned" gas that is being advertised and sold in the Western states under the trade names of "Flamo" and "Shellane" by the Standard Oil Company of California and the Shell Oil Company respectively, and "Pyrofax," "Protane," "Skelgas" and "Philgas" by other oil companies in the Middle West and East, is practically pure propane. As will be noted from the table, propane has a boiling point of -44 deg. F., a vapor pressure of 92.4 lb. per sq.in. at 60 deg. F., and a heat content of 2,521 B.t.u. per cu.ft.

This gas is distributed to the consumer in steel containers with a capacity of 91 lb. of gas or approximately 21 gal. of liquid. An installation for the average home consists of a steel cabinet that houses two such cylinders and a pressure regulator. The installation is connected

A typical "canned" gas installation, with electric service wires entering the house as well



to the house piping. The regulator reduces the pressure of the liquid gas in the cylinder from a point ranging from 92 to 225 lb. per sq.in., depending upon the outside temperature, to 6 oz. or 10 in. of water, which is the pressure on the house system. As one tank is emptied the second is connected to the line by turning a valve, and the customer calls the company for a full cylinder to replace the empty one.

Protection against high pressure on the house system is provided by a mercury seal set to release at 12 oz. Protection against fire is secured with four fusible plugs in the cylinder itself, which are designed to release when the temperature reaches 165 deg. F. The gas itself is naturally odorless and has been odorized to assist in detection when escaping.

The cabinet, containers, and other equipment are leased to a consumer and maintained as long as gas is purchased from the company for a price of $38 cash or $39.50 on terms of $3.80 down and the balance at $2 per month. The gas is sold on a sliding scale of prices depending upon use. The price in California is 10½ cents per lb., and in Oregon and Washington 12½ cents per lb. except in the eastern portions of these states where the price is 13½ cents. For large use the price reaches a minimum of 4 cents. However, the average householder will pay the top price for ordinary consumption. The 10½-cent price is the equivalent of $2.70 per thousand cu.ft. of 550 B.t.u. gas, since a container holds the equivalent of 3,550 cu.ft. of manufactured gas of this heat content.

Up to the present "Flamo" and "Shellane" are only sold in the marketing territory of the two oil companies. The selling force consists of specialists devoting their entire attention to this product. Most modern merchandising methods are employed, including demonstration of the equipment itself upon the consumer's premises.

For best service the gas requires special appliances that are now being produced by several gas appliance manufacturers. On account of the short flame and intense heat, burners on the ranges are set close to the cooking top, usually from ⅝ to ¾ in. from the bottom of the pot or kettle. Efficiencies of these appliances run as high as 55 per cent—much higher than for average gas appliances.

The gas may be used for any purpose for which other types of gas are used, including lighting.

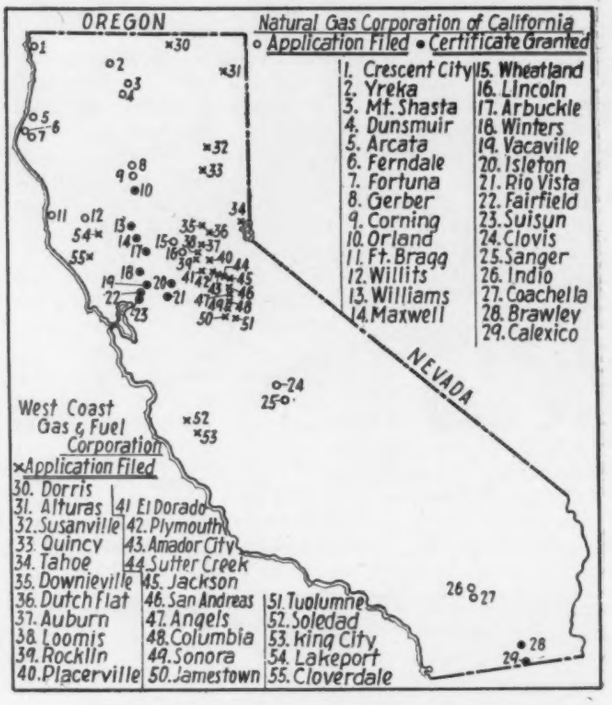
Table I—Physical Characteristics of Propane and Butane

	Propane	Butane
Weight (lb. per gal. at 60 deg. F.)	4.23	4.86
Vapor pressure (lb. per sq.in. at 60 deg. F.)	92.4	11.6
Vapor pressure (lb. per sq.in. at 80 deg. F.)	128.1	22.9
Vapor pressure (lb. per sq.in. at 100 deg. F.)	172.0	37.5
Vapor pressure (lb. per sq.in. at 120 deg. F.)	225.0	56.1
Boiling point (deg. F.)	-44.0	30.9
Volume (cu.ft. per lb. at 60 deg. F.)	8.38	6.28
Volume (cu.ft. per gal. at 60 deg. F.)	35.48	30.52
Calorific value (B.t.u. per cu.ft.	2,521	3,274

Neither of the oil companies sells appliances; this is left to the dealers in the various communities. Installation of piping and appliances in the home also is left to local plumbers or appliance dealers.

Sales efforts are being confined to rural districts and to small communities where other gas is not available.

Opinion is divided as to the competition that "canned" gas presents to the electrical industry. Attempts to make cost comparisons are useless without extensive laboratory tests. To compare "canned" gas with electricity for cooking on a B.t.u. basis is impossible on account of the relative differences in efficiencies of the two types of appliances. The fact remains that electric cooking and water heating are being sold successfully in competition with natural and manufactured gas at prices



Map of California showing communities where butane gas service will be rendered

considerably below the $2.70 equivalent price of "canned" gas. One careful test shows 10-cent "canned" gas to be the equivalent of electricity at 3 cents per kw.-hr.

However, the companies behind this new product are experienced in merchandising and have trained sales forces and extensive advertising appropriations. If the electrical industry matches them with men and money, then there is little to fear from this new competition. In fact it should stimulate the sale of electric ranges and water heaters.

Butane, the other member of the "canned" gas family, presents an entirely different problem. Because of its peculiar characteristics, notably the low pressure at which it may be maintained in liquid state, it is readily transported, either in tank car or tank truck. For the present it promises to play an important part in the gas picture on the Pacific Coast.

Standard Oil Company of California has organized three subsidiaries known as Natural Gas Corporation of California, Natural Gas Corporation of Oregon, and Natural Gas Corporation of Washington for the distribution of butane in small communities in those three states not now having gas service. Application has been made to the California State Railroad Commission for certificates of convenience and necessity for serving butane in 27 towns, and a company that already has certificates for two more towns has been purchased. Certificates have been granted for eleven towns and service will be provided to thirteen in all before the end of the year.

In addition, plans call for the serving of ten communities in Oregon and ten in Washington before the end of the year provided franchises already applied for are granted.

Another company, the West Coast Gas and Fuel Corporation, also has applied to the California commission for certificates for 28 additional towns. All of these are shown on the accompanying map.

Butane gas will be served in these communities through a regular gas distribution system from a central storage point. Table I shows that butane has a boiling point of 31.9 deg. F. and a heat content of 3,274 B.t.u. per cu.ft. As it is drawn from the storage tank, the liquid gas will be vaporized and carburized by means of a steam operated heat exchanger, mixed with air to produce a 550-B.t.u. mixture, and the pressure reduced to the standard gas main distribution pressure. When mixed with air the gas will not condense at low temperatures as it will when in a pure state.

The resultant 550-B.t.u. gas will burn in any ordinary gas appliance and is suitable for any use to which ordinary gas may be put.

Rates established for the communities where certificates have already been granted by the California Railroad Commission include a service charge of $1 per meter per month plus utilization charges of $1.50 per thousand cu.ft. for the first 2,000 ft. per month, $1.25 per thousand for the next 3,000 cu.ft., and $1 per thousand for all over 5,000 cu.ft. per month. On the basis of a domestic consumption of 4,000 cu.ft., which is the approximate average for California, the charge to the consumer will be $6.50.

Brawley will be the first community to be served by this type of service, the Natural Gas Corporation of California anticipating that its plant in that community will be ready for operation by Sept. 1, 1930. Initial estimates of potential customers in Brawley placed the total consumers at 600 by the end of the first year of operation. On July 1, three months before the plant was to go into operation, 1,300 consumers had signed up for service.

Butane gas service will make gas available in almost sixty communities in California and ten each in Oregon and Washington, where hitherto the power companies have furnished the only type of utility service. The competition that may be expected for domestic cooking, water heating and house heating business is self-evident. Heretofore electricity was the only service available to replace wood, coal or oil in the household. From now on the consumer will be offered a choice of either gas or electricity. In many of the towns to be served the power companies have already built up a sizable cooking and water heating business. To obtain more, it will be necessary to redouble selling effort. Many of the lighting customers will be lost entirely, or at least for a long time, from the roll of prospects for electric cooking and water heating.

In all, more than 250,000 present electric consumers will be subjected to the selling efforts of the oil and gas companies in the marketing of propane and butane gas service. The added competition will bring improved service to many homes, whether it be gas or electric. Modern merchandising methods, co-operation among electrical appliance dealers of all classes, and bare-handed selling will bring the electrical industry its share of this business.

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Electric Equipment Makes Oasis of El Centro Playground

ELECTRICITY and its use is one of the features of Kenyon's plunge and miniature golf course at El Centro, in the heart of California's hot Imperial Valley. The picture to the right shows the golf course, which is lighted by R.L.M. reflectors hung on goosenecks and affixed to posts, trees, and similar locations. Because of the brilliant lighting at night, the course is well patronized by people who prefer this means of outdoor exercise in the hot evenings.

The open air swimming pool to the left is just as well lighted as the golf course, and by the same means. Pumps and purifiers for the water in the pool are electric, driven by a 7½-hp. motor. The application of electricity has made Kenyon's a night oasis to the surrounding hinterland.

Engineering

Why Steam Ascendency In California?

For Four Decades Hydro-Electric Power Has Reigned, but Now Is Yielding to Steam-Electric Power. Two Engineers Tell Why

IN THE opinion of California's best engineering talent, the further development of that state's great remaining hydro-electric resources must await further turns of the economic wheel. For more than four decades hydro-electric plants have been the major source of California's electric energy supply, whereas the next decade will see steam-electric stations rise to a dominant position. This is the gist of the opinions of A. H. Markwart, vice-president of the Pacific Gas and Electric Company, and F. B. Lewis, vice-president of the Southern California Edison Company, Ltd., as expressed in papers presented before the recent convention of the National Electric Light Association, in San Francisco.

Hydro is by no means doomed, nor is steam destined to be particularly exalted. The present emphasized trend is but a logical one which represents necessary conformity with the demands of changing economic conditions.

No New Problem

A competitive situation between steam and hydro has existed from the beginning of electric power production in the West. Always there has been the economic basis for thoughtful choice between the two sources of electric power supply.

Mr. Markwart: "It is probable that no single factor has done more toward the creation of taxable wealth for the state of California than its hydro-electric power supply and the transmission incident thereto. To be complete, a history of this state would treat of the electric power industry with special emphasis on hydro-electric development and the part it has played in supporting industry, the influence it has had on increasing the productiveness of agricultural areas, and the marked effect it has had on the general advancement of the state.

"While water power has been of peculiar interest to Californians and a great asset to the state, the lowering of the cost of fuel-produced energy has made it necessary to give fuel power more consideration than it has had heretofore. Steam-electric power always has contributed to the power pool, but such contribution has been that of supplying the hydro energy deficiency in short water seasons and during the dry years, standby against failure of transmission lines, and peak capacity to improve production economy.

"At the outset of power development in California, water power became the basic energy supply because the thermal efficiency of steam plants was low and the price of fuel relatively high. Later on, public interest demanded curtailment of the use of fuel oil as a conservation measure, consequently the conversion into electricity of the power existing in the ever-falling waters of the many mountain streams continued as it had begun."

Mr. Lewis: "Whether to use hydro plants or steam plants as the next increment to production plant capacity has been a question which, until recent years, has been most frequently decided in favor of water power development. Endowed by nature with an abundant potential supply of water power, of which more than a million horsepower has been developed in the state, there nevertheless still remains much undeveloped water power in the region electrically adjacent to the southern California power market, located within transmission distance via the modern high-voltage line.

"During recent years there has been a pronounced trend away from further water power development and toward the use of steam plants, both in southern and central California, by our large utility systems. This is not due to the physical exhaustion of water power possibilities. Steam production has always been an economic competitor of water power production in regions like the Pacific Coast, where water power possibilities exist. Of the total water power potentially available to any region, certain projects, because of favorable hydraulic and topographic conditions peculiar to the particular development, can be constructed more cheaply than others."

A. H. Markwart, vice-president, Pacific Gas and Electric Company

P. M. Downing, vice-president and general manager of the Pacific Gas and Electric Company, and newly elected vice-president of the N.E.L.A., adds his voice to his colleagues' by prophesying that "although we have here in the West an abundance of undeveloped water power, there is every probability that the major part of our future power supply will come from steam... Comparatively few Western companies are increasing their hydro facilities in keeping with their load growth. Several are actively engaged in the construction of huge steam installations."

Composite Production Most Economical

With adequate generating capacity in the two classes of plants, the greatest production economy and best operating flexibility is realized.

Mr. Markwart: "At the present time the power supply of California is on the basis of approximately 65 per cent hydro and 35 per cent steam, which indicates that, despite the popularity of hydro, the advantage of having steam plants to carry the peak load

of a system that is basically hydro, and to act as a reserve has been fully recognized. A combined hydro and steam system, even in California, which has been considered a hydro state, can generate mingled energy more cheaply than could one generating all energy from either source alone provided the load factor is fairly high.

"Experience has indicated that, for a load factor of the order of 60 per cent, which obtains for regional systems such as those of the Southern California Edison Company, Ltd., and the Pacific Gas and Electric Company, composite economy in power production will be had if the load be divided into two parts and the bottom or high load factor portion of the load placed on hydro and the top or low load factor portion of the load placed on steam. The proportion of hydro and steam varies from time to time depending upon the capital cost of hydro and the price of fuel.

"The present trend of water power development costs is upward, because as a general thing the remaining sites cost more to develop and are less accessible than those sites which have already been developed. Moreover, the past ten years for the most part have been subnormal or very dry, and as a result the output from existing plants has been reduced. Consequently, engineers are constrained to establish for new developments a lower average annual output than they otherwise would have established without a knowledge of the effect of

F. B. Lewis, vice-president, Southern California Edison Company, Ltd.

the dry cycle. And too, reduction in investment and operating costs of hydro do not appear probable and it is likely that the already high efficiencies can be improved but very little. Maintenance and depreciation costs can be reduced, but only at the expense of increased capital and correspondingly increased interest charges.

"On the other hand, during the last ten years the fuel economy of steam plants when operating at high load factors has increased from about 250 kw.-hr. per barrel, representing a thermal efficiency of about 13.5 per cent, to 480 kw.-hr. per barrel, a thermal efficiency of about 26 per cent. Now with the installation of very high-pressure, high-temperature units to operate on reheat cycle, it is confidently expected that the fuel economy will be about 510 kw.-hr. per barrel, representing an efficiency of 28 per cent. While this improvement in thermal efficiency of steam plants was appreciated in California, no advantage was taken of it until about 1928 when some fairly high economy steam installations were made in southern California."

Mr. Lewis: "For water power production, the annual cost per kilowatt-year, representing the capital charges and labor of operation, is a fixed quantity independent of load factor. Various individual projects differ in cost per kilowatt-year.

"For steam power production, the annual cost per kilowatt-year is a fixed quantity at zero load factor representing capital charges and standby expense, plus output expense (composed largely of fuel and some maintenance expense, which increase proportionately with output).

"At zero load factor the annual cost of steam power is less than that of water power. Under steam plant efficiencies and fuel costs obtainable some years ago, the additional output expense of steam production, with increased load factor, caused total steam costs to exceed water power costs, except at relatively small load factors. This condition was favorable to water power development at relatively poor load factors, and permitted the use of steam plants only for peak purposes, for standby to secondary water power, and for load builders, preliminary to further hydro development. This has been the condition prevailing as to production resources available for southern California power markets during the earlier part of the last two decades, and has resulted in the economic use of much of the falling water resources of the state."

Changing Conditions Compared

Mr. Lewis: "Output cost of steam production has been greatly lowered because of the cheap fuel situation now obtaining as a result of more extensive production from our oil and natural gas resources, and also on account of the increased size and greatly improved efficiency of the modern high-pressure steam plant as compared with the type of steam installation formerly available. The following figures which represent actual experience of the Southern California Edison Company, Ltd., from 1925 to 1929 inclusive, forcefully illustrate the trend of steam plant production costs:

	1925	1926	1927	1928	1929
Total operation and maintenance cost per kilowatt of installed capacity (dollars)	3.46	2.37	1.97	183.	1.75
Average fuel cost per kw.-hr. (mills)	2.7	2.3	2.1	1.7	1.4
Total production expense per kw.-hr. (mills)	4.3	3.2	3.9	2.5	1.8

"Under present conditions, the cost of steam power is less at all usable load factors than the cost of power from the cheapest undeveloped hydro project available to southern California, not ignoring the results expected from the proposed Boulder Dam project. The lowering of steam output costs has stripped water power of its former favorable asset, that of secondary power value."

True Conservation of Natural Resources

Fuel supply, of course, shares the center of the economic stage with steam plant fuel efficiency. Natural gas, available in tremendous quantities from southern and central California fields, thus has become a most important factor.

Mr. Markwart: "It must be remembered that 250 billion cu.ft. of natural gas were wasted in 1929. This waste is being continued since the major gas producing fields wasted 22.5 billion cu.ft. in January, 1930, and probably considerably more in the months which followed. If the 1929 wastage had been burned under steam boilers for electric generation it would have produced 22 billion kw.-hr., an amount of energy equal to the requirement of the state twenty years hence. As only slightly more than nine billion kw.-hr. were produced in California in 1929, it appears that all requirements of energy for the entire state could be answered through a conversion of the potential quantities of natural gas in its fields, with much to spare. In the face of this wasting asset, it is difficult to predict the future of hydro."

What if fuel prices rise?

"No matter what fuel economies and fuel prices are, steam power has been and always will be required in connection with hydro for other than best economy in kilowatt-hour production. With perhaps one or two exceptions, notably the Pit River with its remarkably sustained flow, and the North Fork of the Feather River in California actually will require a half-kilowatt or more with the same stream characteristic increased materially by very cheap storage, all hydro-electric developments in California actually will require a half kilowatt or more of installed steam capacity for every kilowatt of hydro capacity, in order to safeguard against a water shortage in dry years."

Ten Years of Steam Construction?

Mr. Markwart: "Total energy generated in California during 1929 was 9,013 million kw.-hr., an increase since 1919 when the load was 3,235 million kw.-hr., of 5,778 million kw.-hr., or 179 per cent. The 1929 peak on the basis of 60 per cent load factor may be placed at 1,700,000 kw. If it be assumed that the increase in load for the next ten years will be 100 per cent, the peak for 1939 will be 3,400,000 kw. The switchboard output capability at present has been roughly established at 2,040,000 kw., which indicates that additional generating capacity to the extent of 1,360,000 kw. will be required to just meet the ten-year growth of load.

"If this growth of load were to be met with all steam, the load at the time (1939) would be carried 1,340,000 kw. on hydro and 2,060,000 kw. on steam, or on the basis of 40 per cent hydro and 60 per cent steam, as compared with the present situation of about 80 per cent hydro and 20 per cent steam, if it be assumed that existing hydro is all actively employed, and to 65 per cent hydro and 35 per cent steam when the load catches up with the present output capability of some 2,040,000 kw."

Mr. Lewis: "The trend of production for utility systems in southern California is definitely toward the use of steam generating equipment for additional plant expansion, and has been so for the past five or six years, to an increasing degree. While low fuel prices at present levels contribute to the influence in favor of steam production, this element of cost is not so important a factor as it once was, because of the relatively high fuel efficiencies obtainable from modern plants. Hence, the modern steam station is less vulnerable to rising fuel prices than was its less efficient predecessor. The Southern California Edison Company, Ltd., in carrying into execution this policy of steam generation, has expanded its steam capacity since 1923 by 400,000 hp., and has initiated a steam construction program, to be carried out as the load may require it, that contemplates the installation of six additional steam turbines, each of 134,000-hp. capacity, in its Long Beach steam plant No. 3. This plant now has in operation two such machines, making the ultimate capacity of this one station in excess of 1,000,000 hp."

Mr. Markwart: "A factor which leads one further toward the conclusion that the power companies are headed toward 100 per cent steam for their added necessities for a time, is that on most California streams a full development of the stream is necessary in order that the cost of storage, which is usually high, may be a charge against all of the power from a comprehensive development of the power stretch of a stream instead of against the power of any single project on the stream. This statement regarding full development is true of most of the streams of the state.

"However, the Pit and the North Fork of the Feather, where storage is respectively unnecessary or negligible in cost, are susceptible to step-by-step development at a unit cost substantially no greater than that obtaining for a complete development. Such ideal situations, however, are rare and may be disregarded in general observations of the sort that are being made here. What, in fact, generally must be done now to make hydro at all economic, is to complete comprehensive developments in one step, as far as this is possible from a construction standpoint, with completion timed in accordance with their capacity and the growth of system load so that they can be fully employed when they go on the line."

The Legal Situation Influences

Mr. Lewis: "Two other factors militate against water power development on the Pacific Coast. One is the legal situation in respect to a clear definition of the relative right of a power project to reservoir water in the upper reaches of the stream as against the riparian owner's use in the lower reaches of the stream. This situation injects an uncertain element in the costs of water power projects and has, in some instances, caused expensive litigation and additional capital expenditures to satisfy riparian claims. The other factor is that to the public mind, and particularly to the political mind, water power costs little or nothing. Therefore, not realizing that the utilization of falling water in the development of power, which entails an investment per unit of capacity many times that which is involved in steam plant production, there is always the danger of unjustifiable political attack, on the theory that the power company should be prevented from 'getting for nothing that which belongs to the public.'

"If it were generally understood that it is as much a manufacturing operation to make electricity from falling water as to make it from fuel, this second factor would not militate against water power. Steam plant production is immune to both of these factors of legal uncertainty and interference by political agencies and should, for these reasons, be more attractive for utility operations even at costs slightly in excess of water power."

Conclusions

The trend toward greater capacities in steam-electric stations on the Pacific Coast in general and in California in particular is, after all, just an answer to changing economic conditions.

Mr. Lewis: "With the tremendous oil and natural gas resources of southern and central California offering a continuation of a favorable fuel supply, supplemented by practically inexhaustible resources of coal located in adjacent states, and obtainable at reasonable prices, together with the prospect of still further economies in steam generation, there is a very good indication that conditions will continue to favor steam generation for an indefinite future period."

Mr. Markwart: "On the basis of the observations made, it would seem that the electrical industry in California is looking at present toward 100 per cent steam for the purpose of taking care of system growth. In the face of probable high cost of many known hydro sources, apparently there is no danger from an economic standpoint of getting too large a proportion of steam in the make-up of system supplies which are now largely hydro.

"If fuel prices continue to decline, steam installations safely can be made until the major portion of the system load growth for a period is carried on steam, looking to a total capacity divided approximately evenly between hydro and steam. If fuel prices rise materially, hydro may be increased, provided that it has its complement of steam in order to place the hydro, which in general will be relatively high in capital cost, on a high load factor, so that it can produce its complement of energy at a low unit cost."

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Reactive Kva. Metering—I

Opening a Series of Discussions Concerning Some Fundamentals and Practical Considerations Involved

By E. C. Goodale, Tacoma, Washington

VARIOUS schemes have been in use for some time for securing measurements of the reactive kva. passing over a line or to a certain consumer. These reactive kva. measurements may be of the indicating kind, analagous to those obtained by an indicating wattmeter, or they may be of the integrated kind as are the kilowatt-hours obtained by means of watthour meters.

One of the more common uses of the indicating type of reactive kva. meter is to determine the reactive kva. load of some part of the power system, this information to be used by the engineering department for various purposes, such as the determination of voltage regulation or to find the best locations for synchronous or static condensers.

Preliminary Discussion

Reactive kva. may have either "leading" or "lagging" characteristics, depending upon the circuit and load characteristics. The net result is the same, however, as far as efficient loading of lines or equipment is concerned.

Consider, for instance, the simple typical circuit indicated in Fig. 1. Assume that E represents a potential of 10,000 volts (a.c., pure sine wave). Assume further that a current of 400 amp. flows through an inductive reactance, X_L, which represents the induction motor load of the usual power circuit. This current will lag the applied voltage by 90 deg. With R a pure resistance representing the lighting load of the usual circuit, its assumed current of 300 amp. will be in phase with the applied voltage. Capacity reactance X_C is added to the circuit to compensate for part of the inductive load and represents a condenser designed to draw 175 amp. at an angle leading the applied voltage by 90 deg.

From Kirchoff's current law in its modified form it is evident that the current I_1 entering the junction point "b" equals the vector sum of the currents leaving $(I_L + I_R)$ minus any other current entering (none). Hence, vectorially $I_1 = I_L + I_R$. By adding these vector quantities in the regular heel-and-toe manner and scaling

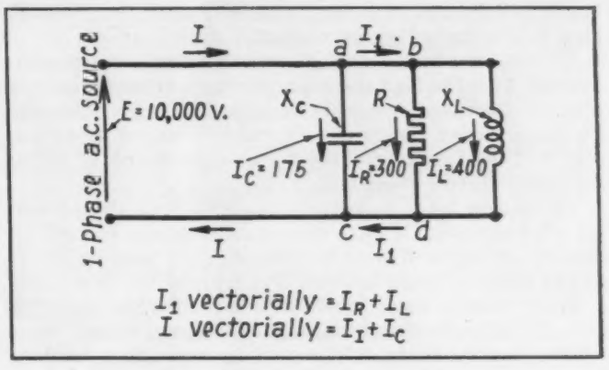


Fig. 1. Schematic diagram of simple circuit containing resistance, inductance and capacitance

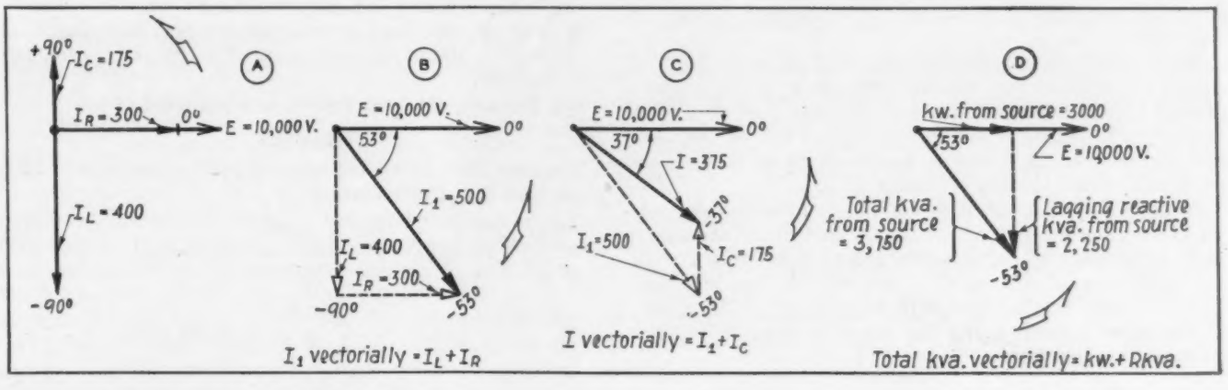
the resultant vector, it may be found that $I_1 = 500$ amp., lagging the voltage E by an angle of 53 deg. (For details of vector addition and subtraction see Electrical West, March 1, 1927, pp. 149-51.)

Since I_R and I_L form a right triangle, their resultant, I_1, also may be determined by the well-known "root-mean-square formula":

$$I_1 = \sqrt{I_L^2 + I_R^2} = 400^2 + 300^2 = \sqrt{250{,}000} = 500 \text{ amp.}$$

Suppose it has been considered that 500 amp. is too heavy a current to draw from the source and, accordingly, in order to reduce it the condenser X_C is placed across

Fig. 2. Vector relationships of electrical quantities involved in the circuit of Fig. 1



the line. With this condenser drawing 175 amp. at an angle of 90 deg. leading, as previously assumed, and as shown in Fig. 2A, then (again by Kirchoff's law) the source current I must equal (vectorially) $I_1 + I_C$. As shown in Fig. 2C this vector sum or resulant current I is

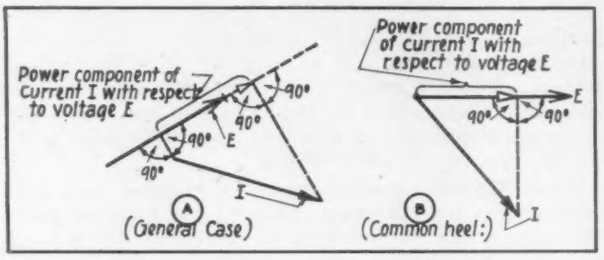


Fig. 3. Determining power components vectorially

equal to 375 amp. at an angle of —37 deg., the "minus" sign indicating a lagging current.

Hence, by placing the condenser across the line in parallel with the load the current drawn from the source may be decreased from 500 amp. to 375 amp. Thus the I^2_R losses in the supply circuit will be reduced by 44 per cent and the resultant current I is more nearly in phase with the source voltage than is I_1.

Up to this point amperes only have been considered. On a large system a more comparable basis is formed by dealing in terms of kva. because no note need be taken of the ratios of transformers that may be involved.

In the circuit under consideration the lagging reactive kva. of the inductive branch of the circuit amounts to 4,000. Counteracting this in part is the leading reactive kva. of the capacity branch of the circuit, which amounts to 1,750. Since the vectors representing these two quantities are at 180 deg. with respect to each other, the net vectorial quantity which represents the net reactive kva. of the circuit (in this case lagging) scales 4,000 — 1,750 = 2,250 kva. As shown in Fig. 2D, the 3,000-kw. in-phase component of the circuit load combines with the 2,250-kva. quadrature component, with the result that the total load of the circuit becomes 3,750 kva.

Standard Meter

A standard a.c. wattmeter, when properly energized, measures the product of its voltage multiplied by the power component of its current with respect to that voltage. The power component of any current (of the same frequency as the voltage) with respect to a voltage is determined by dropping perpendiculars from the ends of the current vector to the line of the voltage vector. The distance (measured along the line of the voltage vector) between these perpendiculars is the power component of that current with respect to that voltage (to the same scale as the current vector). An example is given in Fig. 3A.

More often in comparing vectors they may have a common heel as in Fig. 3B. In this case only one perpendicular need be dropped, the power component of I with respect to E being the distance along the line of the voltage vector from the common heel to the foot of the perpendicular from the tip of vector I.

In any case in which it is desired to measure the lagging reactive kva. of a circuit all that it is necessary to do is to energize the potential coil of a wattmeter with a voltage numerically equal to, but 90 deg. lagging, that voltage which would be used in measuring the kilowatts of the same circuit, using the same current as for the kilowatt measurement.

For example, in Fig. 4A is shown a circuit of 10 kv. supplying a load of 300 amp. at 30 deg. lag, corresponding to 0.866 power factor. The potential transformer ratio is 100/1 and the current transformer ratio 60/1. Hence the transformation ratio will be 6,000/1. The wattmeter is connected as shown and the vector relations are as indicated in Fig. 4B.

To measure the kilowatts of such a single-phase circuit the connections would be as shown in Fig. 4A. To measure the lagging reactive kva., however, it would be necessary to secure a voltage e_1 numerically equal to, but lagging e by 90 deg. Because in a single-phase source there is only the one voltage, it is necessary to "manufacture" such a voltage by the choice of suitable auxiliary equipment, such as capacitors and reactors.

Two principal classes of wattmeters are in common use. In one of these the potential element is made up of both resistance, R, and inductive reactance, X_L. In the other the element is practically all resistance. The induction wattmeter is the most common example of the first class, and the electro-dynamometer wattmeter illustrates the latter or pure resistance class.

In order to "manufacture" a voltage, e_1, which will lag the given voltage, e, by 90 deg., it is necessary to shunt the potential element of the wattmeter by a capacity reactance, X_C, and to insert an inductive reactance, X_L, in series with the combination, as shown in Fig. 5A.

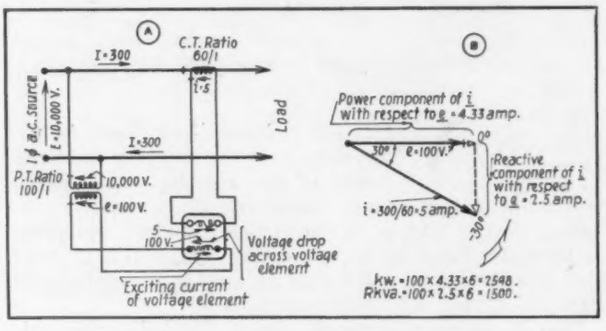


Fig. 4. Wattmeter connections for the measurement of kw. or kva. in a single-phase circuit

The size of the multiple capacity reactance will be:

$$X_C = \frac{R^2 + X^2}{R + X}$$

The size of the series inductive reactance will be:

$$X_L = \frac{R^2 + X^2}{R}$$

In which:

X_C = ohms multiple capacity reactance.
X_L = ohms series inductive reactance.
R = ohms resistance of wattmeter potential element.
X = ohms inductive reactance of wattmeter potential element.
(R includes external resistors when used.)

Example

Suppose that in an induction-type wattmeter R = 500 ohms and X = 1,000 ohms.

$$\text{Then } X_C = \frac{500^2 + 1{,}000^2}{500 + 1{,}000} = 833 \text{ ohms.}$$

$$X_L = \frac{500^2 + 1{,}000^2}{500} = 2{,}500 \text{ ohms.}$$

The corresponding capacity, C, in farads is expressed by the equation

$$\frac{1}{2\pi f X_C}, \text{ where f is the frequency.}$$

Hence, assuming 60-cycle frequency:

$$C = \frac{1}{2 \times 3.14 \times 60 \times 833} = 0.000,003,18$$

farad, or 3.18 microfarads.

Likewise, the inductance, L, in henries, is expressed by the equation

$$\frac{X_L}{2\pi f}.$$

$$\text{Whence } L = \frac{2,500}{2 \times 3.14 \times 60} = 6.63 \text{ henries.}$$

It is apparent, then, that with a 3.18-mf. condenser in multiple and a 6.63-henry inductance in series with its potential element, the wattmeter would register correctly the reactive kva. in the circuit of Fig. 5A. The vector relations would be as shown in Fig. 5B. It may be noted that whereas the 2.5-amp. component of i was the reactive component with respect to e, it is a power component with respect to voltage e_1 and hence the reactive kva. meter will register in proportion to the value of this component. That is, as the current lags more and more, this reactive component becomes larger and larger, and hence the reactive meter will register more and more.

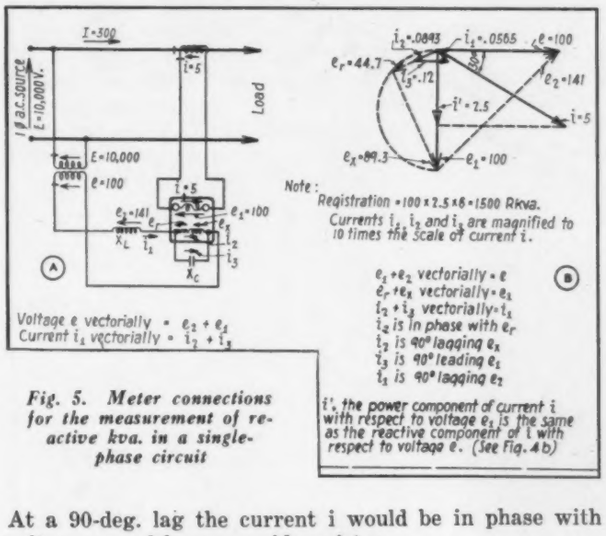

I=300
I=5
1 ϕ a.c. source
E=10,000
Load
e=100
e₂=141
e₁=100
Voltage e vectorially = e₂ + e₁
Current i₁ vectorially = i₂ + i₃
Note:
Registration = 100 x 2.5 x 6 = 1500 Rkva.
Currents i₂, i₃ and i₁ are magnified to 10 times the scale of current i.
e₁ + e₂ vectorially = e
eᵣ + eₓ vectorially = e₁
i₂ + i₃ vectorially = i₁
i₂ is in phase with eᵣ
i₂ is 90° lagging eₓ
i₃ is 90° leading e₁
i₁ is 90° lagging e₁
i', the power component of current i with respect to voltage e₁ is the same as the reactive component of i with respect to voltage e. (See Fig. 4b)

Fig. 5. Meter connections for the measurement of reactive kva. in a single-phase circuit

At a 90-deg. lag the current i would be in phase with voltage e_1 and hence would register

$$\frac{100 \times 5 \times 6,000}{1,000} = 3,000 \text{ reactive kva. lagging.}$$

Had the wattmeter been of the electro-dynamometer class, that is, having no inductive reactance, the X terms would be zero in the equations for finding X_C and X_L, so that X_C would equal R as also would X_L.

Assuming now that an electro-dynamometer wattmeter has a total potential circuit resistance of 5,000 ohms, the multiple capacity reactance, X_C, would equal 5,000 ohms, as also would the series inductive reactance, X_L. Therefore: The capacity of the multiple condenser should be

$$\frac{1}{2 \times 3.14 \times 60 \times 5,000} = 0.53 \text{ mf.}$$

The series inductance should be

$$\frac{5,000}{2 \times 3.14 \times 60} = 13.26 \text{ henries.}$$

Fig. 5B illustrates the vector relations of all the quantities involved in the case of the induction wattmeter having a resistance of 500 ohms in its potential circuit and an inductive reactance of 1,000 ohms. It may be seen, as a matter of interest, that the laws of electrical circuits hold faithfully in using the expressions given to determine the values of X_C and X_L necessary to change this wattmeter into a reactive kva. meter. It will be left to the reader, however, to check through the diagram to see that it complies with these laws, if he so desires. It is considered best not to complicate the foregoing discussion with too much detail on the "how" and "why."

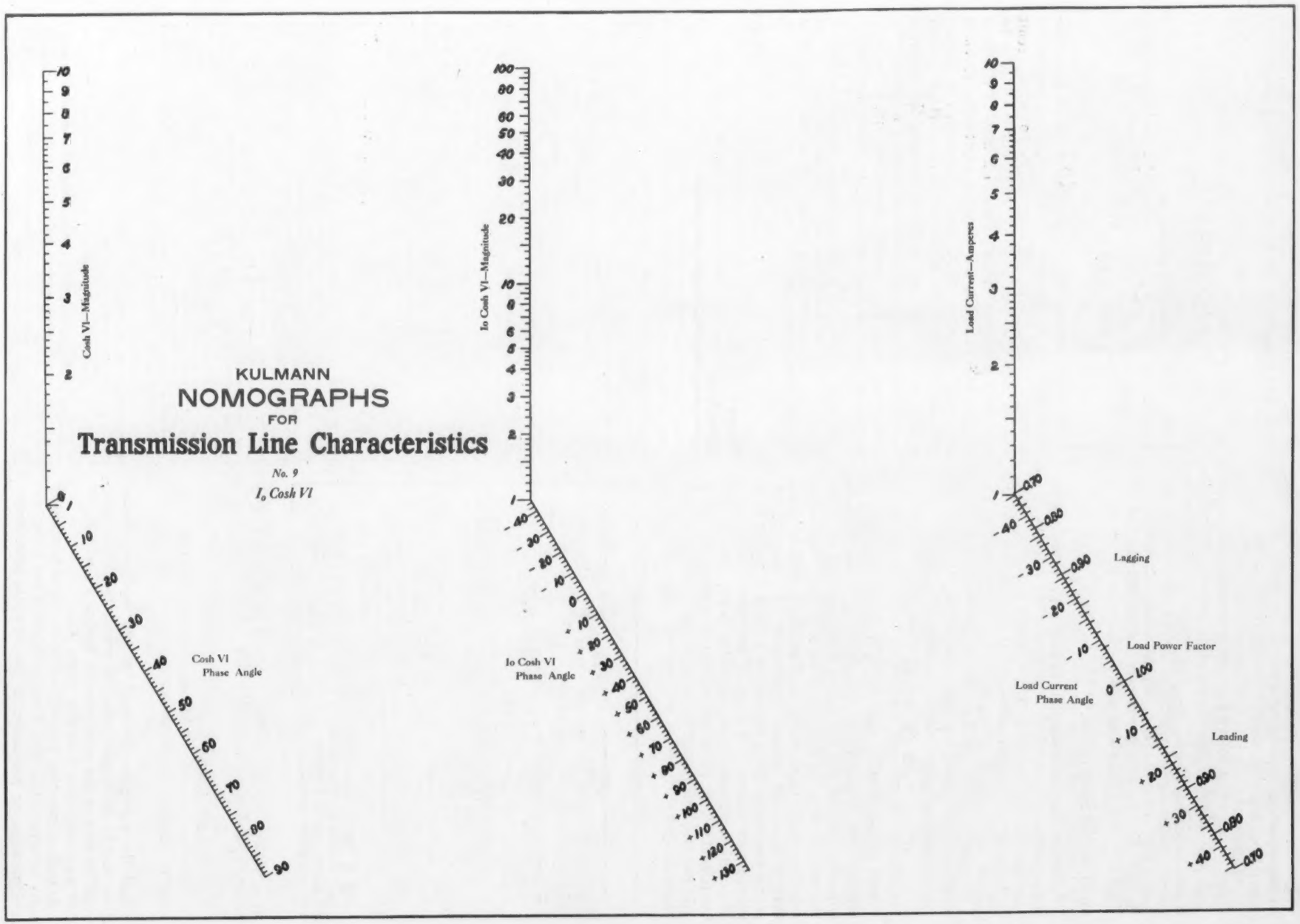
EDITOR'S NOTE: An article discussing another method of phase shifting in connection with the measurement of reactive kva. on a single-phase circuit will appear in an early issue of ELECTRICAL WEST.

New Books

MATERIALS FOR THE STUDY OF PUBLIC UTILITY ECONOMICS, by Herbert B. Dorau, associate professor of economics in the school of commerce, Northwestern University, and research associate in the Institute for Research in Land Economics and Public Utilities. Cloth-bound; 975 pages; 5½ x 8½ in.; illustrated; first edition. Published 1930 by The Macmillan Company, New York, N. Y. Price $5.—This is one of the "Social Science Text-books" edited by Richard T. Ely, director of the Institute for Research in Land Economics and Public Utilities, and research professor of economics in Northwestern University. The book presents in undigested, unopinionated, and controversial form a valuable collection of material covering the economics of public service industries. In so far as possible, all sides of important subjects have been given equal exposition by the authors, although they naturally were hampered by lack of material representing some points of view. Subject matter is well handled and coveniently subdivided under seventeen chapter headings, which include successively the development of the public service industry, units and measurements, economic characteristics of public service industries, the legal status of the public service industry, regulation of public service industries, the cost of service, the labor factor in the public service industry, taxation of public service corporations, the value of property and plants, maintaining the plant and the investment, capital and capitalization, the rate of return, the cost of public utility capital, the revenue of public service industries, price of public utility services, and ownership of the public service industries.

THE SECRETARY'S HANDBOOK—A manual of correct usage, by S. A. Taintor and K. M. Monroe, respectively of the Department of English, Theodore Roosevelt High School, and Department of English, Haaren High School, New York, N. Y. Cloth-bound; 5 x 8 in.; 372 pages. Third edition, revised. Published 1930 by The Macmillan Company, New York, N. Y. Price $3.50.—This book is listed here as a good book for the engineer because the engineer has valuable and important reports to write and should, for his own best advantage, have available at least for reference a good manual of correct usage. This volume is designed for quick reference service and is intended for daily use. Part I contains authoritative rules of good usage with practical illustrations of correct form in capitalization, punctuation, division of syllables, and many important points of grammar. Part II includes examples of various types of business, social and official letters, together with information concerning other business forms and specific directions for the preparation of manuscripts for publication.

X-RAYS, by B. L. Worsnop, B.Sc., Ph.D., lecturer in physics, Kings College, London, England. Cloth-bound; 4 x 6½ in.; 101 pages; 36 illustrations. Published 1930 by E. P. Dutton and Company, Inc., New York, N. Y. Price $1.10.—This book is one of a series of "monographs on physical subjects." It presents an outline of X-rays, sets forth details of the determination of wave lengths, and gives consideration to some of the more important physical properties of X-rays as now understood. The author concludes his work with an account of the recent methods of investigation of defraction, reflection and refraction.


KULMANN
NOMOGRAPHS
FOR
Transmission Line Characteristics
No. 9
I_o Cosh VI
Cosh VI—Magnitude
Cosh VI
Phase Angle
Io Cosh VI—Magnitude
Io Cosh VI
Phase Angle
Load Current—Amperes
Lagging
Load Power Factor
Load Current
Phase Angle
Leading

Transmission Line Nomographs

No. 9—Graphical Solution for Determining Numerical Values of First Term of Current Characteristic Equation

By C. ALBERT KULMANN
Pelton Water Wheel Company, San Francisco

HAVING completed with chart No. 8 the evaluation of the two terms of the voltage characteristic equation of a transmisison line (ELECTRICAL WEST, Nov. 1, 1929), the next logical step is the evaluation of the two terms of the current characteristic equation. Instead of combining the voltage terms now, that step will be treated later since the same chart can be used for combining both the voltage and current equation terms.

The first of the current characteristic equation terms is I_o cosh Vl, the entire equation being

$$I_1 = I_o \cosh Vl + E_o W \sinh Vl$$

where I_1 is the generator current, I_o is the load current, E_o is the load voltage, V is the hyperbolic angle of one mile of line, l is the line length in miles, and W is the surge admittance in mhos per mile. This equation, for a given line, reduces to $I_1 = I_oA + E_oD$, where A and D are constants of the line (A also being used in the voltage equation). D is to be evaluated in nomographs Nos. 10 and 11 which will be published in later issues of ELECTRICAL WEST. This discussion and chart give a graphical solution of the first term, I_o cosh Vl.

Referring to the nomograph on the facing page, observation shows that it is scaled without regard for the actual ranges of the various quantities represented. If the values of the individual factors lie outside of the range shown, suitable conversion factors are used. To bring the working values within the range of the chart, the true magnitude values are multiplied by the required multiple of ten, whereas for the angles the necessary multiple of 90 deg. is subtracted from the true values.

Then, of course, the final result obtained from the chart must, in the case of magnitudes, be divided by the multiple of ten by which it was previously multiplied and, for angles, have added to it the multiple of 90 deg. which was previously subtracted.

In using the chart, take the value of cosh Vl as found by means of chart No. 5 (ELECTRICAL WEST, Jan. 1, 1929), multiply its magnitude by some multiple of 10 which will bring it between 1 and 10, and locate the corresponding point on the cosh Vl—magnitude scale. Proceed in the same manner with the value of the load current magnitude and connect the two points obtained with a straight-edge, reading the value of I_o cosh Vl on its scale. This value then is divided in turn by the factors by which the original values were multiplied, to obtain the true value of the magnitude of I_o cosh Vl.

Angles then are considered. If the phase angle of cosh Vl is greater than 90 deg., subtract 90 deg. or some multiple of it which will leave a working value between 0 and 90 deg., and locate the corresponding point on the cosh Vl—phase angle scale. Locate then the point corresponding to the proper value on the load current—phase angle or power factor scale, and connect the two points with a straight-edge, reading I_o cosh Vl—Phase Angle. To the observed value is then added the angle previously subtracted, to obtain the true angle.

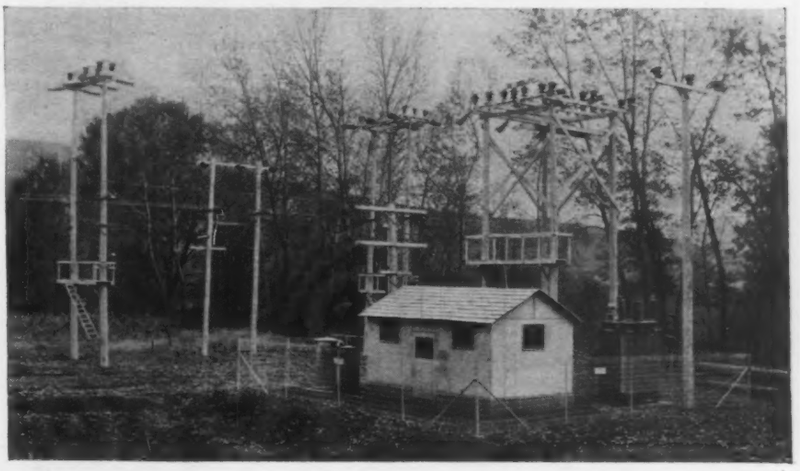
EXAMPLE

Take for an illustrative case, values of 0.4 at 85 deg. for magnitude and angle of cosh Vl, and a load current of 150 amp. with a lagging power factor of 30 deg. (−30 deg.). Neither magnitude falls within the chart, hence the former is multiplied by 10 and the current value by 0.01. The resulting value found for I_o cosh Vl is 6.0, which must be divided by 10 and 0.01, giving the true value as 60.

Both angles fall within the scale ranges of the chart. Therefore, the result read from the I_o cosh Vl—Phase Angle scale is the true value, and the quantity I_o cosh Vl is fully evaluated as a vector of magnitude 60 and angle of 35 deg. with respect to load voltage.

▼ ▼ ▼

Unattended Rural Substation



THIS outdoor substation of the Pacific Power & Light Company in Waitsburg, Wash., serving the town of Waitsburg and surrounding rural territory, is unattended except for a daily inspection and meter reading by an operator. Operation of this 500-kva., 66/6.6-kv. station is manual, although an alarm system rings a bell in the company's Waitsburg office whenever a switch kicks out. The building is factory built of pressed steel and contains equipment for four out-going 6.6-kv. feeders. A single voltage regulator serves the 6.6-kv. bus.

Commercial

Experimenting With House Heating

A Commercial Manager Decides to Find Out for Himself the Feasibility of Electric Heat by Tests in His Own Home

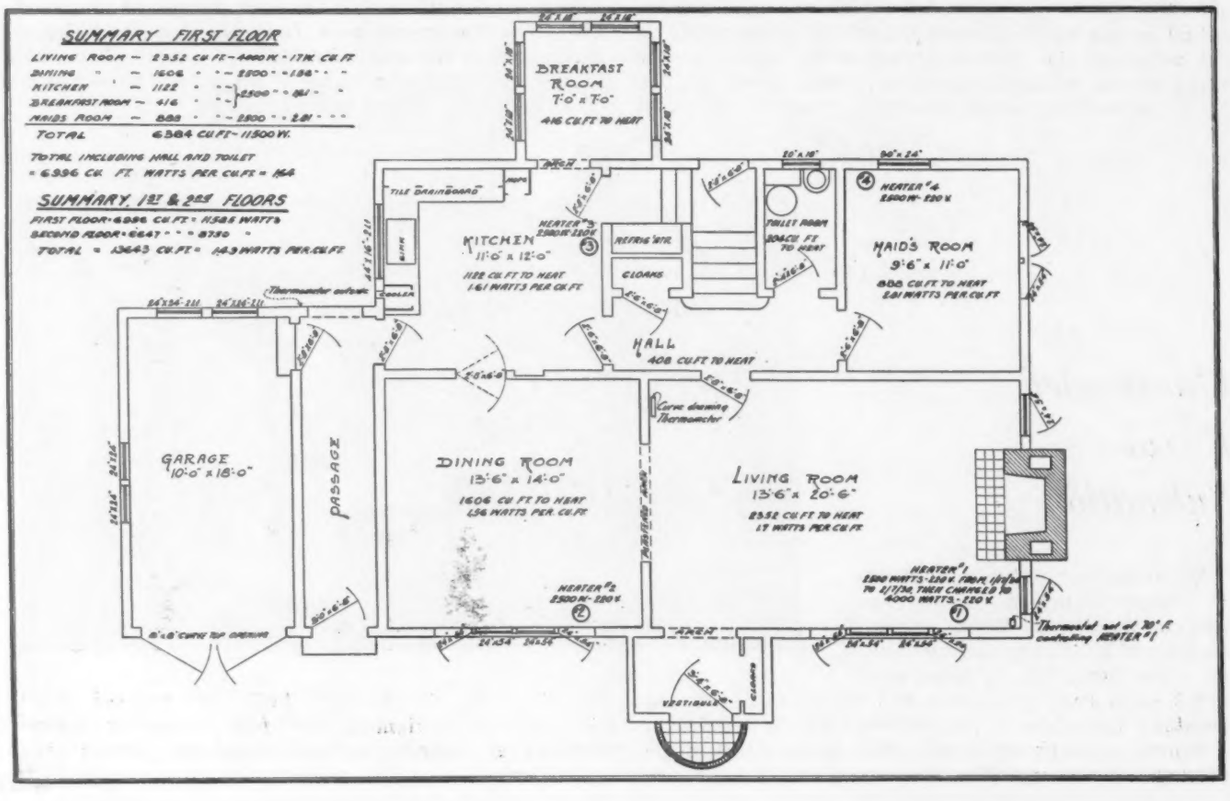
By J. C. PLANKINTON,
Sales Manager, Northwestern Electric Company, Portland

GENERAL interest manifested by the electrical industry and the public in the possibility of using electricity for house heating, coupled with the appearance on the market of an air circulating type of heater which seemed to possess several improved features, led to my decision to experiment with this heater in my home in Portland during the past heating season.

Fig. 1. Heater of the type used by Mr. Plankinton in tests related below

I have always felt that primary heating with electricity for the average house in Portland was not feasible from the standpoint either of the central station or the consumer. The houses here are generally not well enough insulated to conserve heat, so radiation losses are excessive, and the waste of kilowatt-hours at present rates would cause higher costs than it is likely the customer would be willing to pay. Further, it seemed that the central stations could not offer a rate for this service that would attract many customers. Climatic conditions in this territory are such as to cause a wide variation

Fig. 2. First floor plan, home of J. C. Plankinton, with data concerning heating tests


SUMMARY FIRST FLOOR
LIVING ROOM — 23.52 CU FT — 4000 W = 17W. CU FT
DINING " — 1606 " " — 2500 " = 1.56 " "
KITCHEN " — 1122 " " — 2500 " = 2.61 " "
BREAKFAST ROOM — 416 " " — 2500 " = 6.01 " "
MAIDS ROOM — 888 " " — 2500 " = 2.81 " "
TOTAL 6384 CU FT — 11500 W.
TOTAL INCLUDING HALL AND TOILET = 6396 CU FT WATTS PER CU FT = 1.64
SUMMARY, 1ST & 2ND FLOORS
FIRST FLOOR = 6396 CU FT = 11586 WATTS
SECOND FLOOR = 6647 " " = 8750 "
TOTAL = 13043 CU FT = 1.49 WATTS PER CU FT
BREAKFAST ROOM 7'0" x 7'0" 416 CU FT TO HEAT
KITCHEN 11'0" x 12'0" 1122 CU FT TO HEAT 1.61 WATTS PER CU FT
MAID'S ROOM 9'6" x 11'0" 888 CU FT TO HEAT 2.81 WATTS PER CU FT
HALL 408 CU FT TO HEAT
DINING ROOM 13'6" x 14'0" 1606 CU FT TO HEAT 1.56 WATTS PER CU FT
LIVING ROOM 13'6" x 20'6" 23.52 CU FT TO HEAT 1.7 WATTS PER CU FT
GARAGE 10'0" x 18'0"
PASSAGE
TOILET ROOM 204 CU FT TO HEAT
REFRIG'TR
CLOSETS
TILE DRAINBOARD
SINK
COOLER
VESTIBULE
CLOSET
HEATER #1 2500 WATTS - 220 V. TAPS CHANGED TO 4000 WATTS - 220 V.
HEATER #2 2500 W - 220 V.
HEATER #3 2500 W - 220 V.
HEATER #4 2500 W - 220 V.
Thermostat out of 20" R. controlling HEATER #1
Thermometer outside
Curve showing Thermometer
6'-6" CURVE TOP OPENING

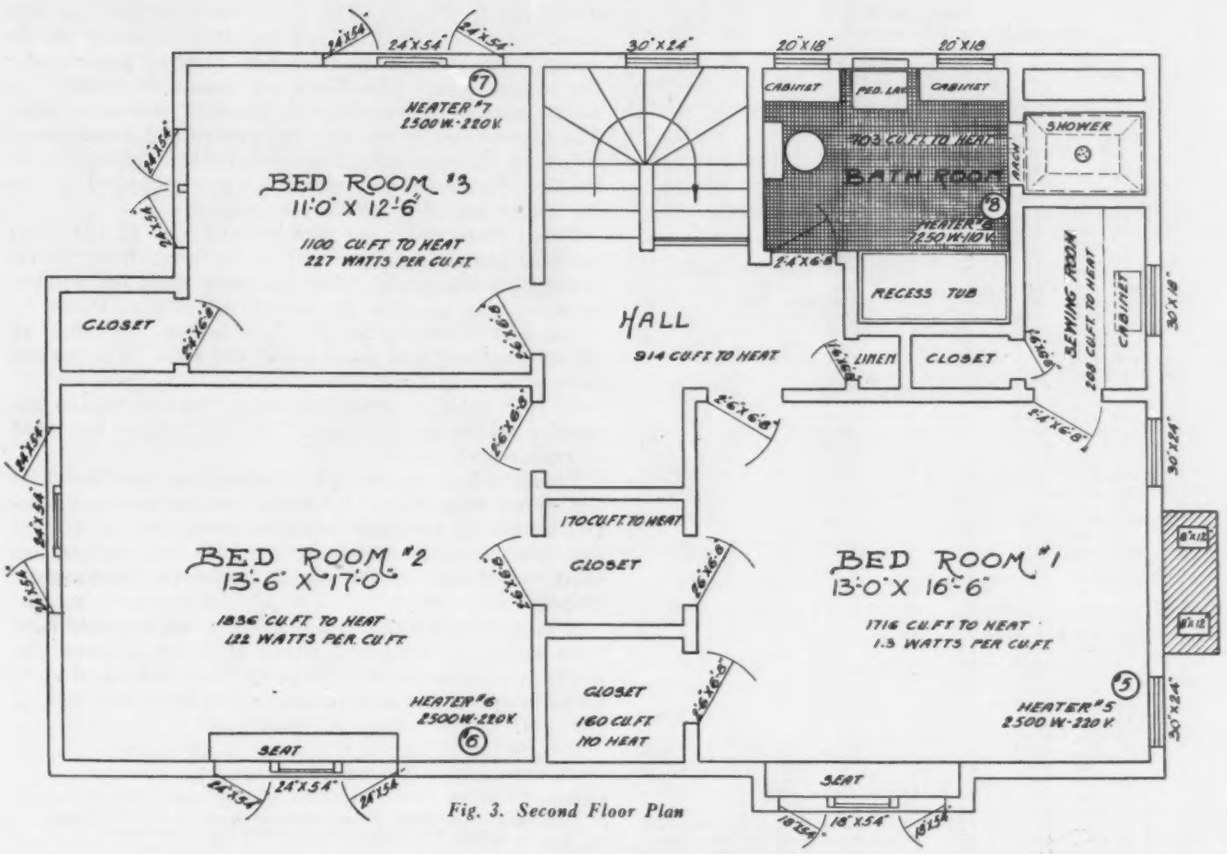


Fig. 3. Second Floor Plan

MONTH	1925				1926				1927				1928				1929				1930			
	Cu. Ft. Gas	Bill In $	Temp. Mean	Degree Days	Cu. Ft. Gas	Bill In $	Temp. Mean	Degree Days	Cu. Ft. Gas	Bill In $	Temp. Mean	Degree Days	Cu. Ft. Gas	Bill In $	Temp. Mean	Degree Days	Cu. Ft. Gas	Bill In $	Temp. Mean	Degree Days	Cu. Ft. Gas	Bill In $	Temp. Mean	Degree Days
JAN.	46,700	25.61	44.8	628	47,000	27.10	42.8	687	61,500	35.09	39.1	803	49,800	27.94	38.6	820	58,000	32.34	34.2	961	29,000	16.78	28	1141
FEB.	34,800	19.39	46.3	523	31,800	18.72	48.7	457	41,100	23.27	45.6	541	40,000	22.68	44.2	603	48,200	27.07	35.6	821				
MAR.	32,000	17.93	47.4	543	20,400	12.44	53.5	355	36,200	20.63	46.9	559	30,900	17.79	50.8	444	37,400	21.28	47.7	539				
APR.	18,200	10.72	54.2	330	11,400	7.49	60.2	186	22,400	13.23	51.9	395	16,800	10.22	51.4	409	20,000	11.94	49.2	475				
MAY	7300	5.03	61.2	141	7,000	4.95	59.2	193	10,500	6.84	55.4	304	600	1.07	62.6	120	5,400	4.10	58.6	211				
JUNE	2500	1.79	63.5	115	1,600	1.81	67.0	60	0	0.85	64.4	61	0	⊛0.85	62.2	98	1800	2.23	62.4	114				
JULY	0	0.00	69.8	11	0	0.00	70.5	5	0	0.00	68.6	16	0	0.00	69.0	26	0	0.00	68.3	10				
AUG.	1400	1.46	66.0	51	0	0.00	69.2	1	0	0.00	69.3	23	0	0.00	67.5	17	0	0.00	69.1	6				
SEPT.	8,900	5.86	62.9	92	18,400	11.34	61.6	133	11,400	7.32	61.9	113	11,300	7.27	61.5	128	1,800	1.95	64.8	70				
OCT.	30,900	17.36	55.8	289	25,000	14.98	57.8	220	21,600	12.80	55.0	309	23,700	13.66	54.7	321	15,400	9.47	58.5	207				
NOV.	33,900	18.93	46.0	577	41,600	24.12	50.6	430	37,700	21.45	49.8	454	44,200	24.93	46.6	552	34,800	19.88	44.8	591				
DEC.	43,900	24.15	45.8	595	56,800	32.50	41.0	743	67,000	37.17	37.8	846	51,100	28.64	40.2	771	39,200	22.25	45.3	615				
TOTAL	260,500	148.13		3895	261,000	155.45		3470	309,400	178.65		4424	267,900	155.05		4309	262,000	152.51	53.2	4620				

All consumptions are for the period approx., 8th of month to 8th of succeeding month. (i.e., Jan 8th to Feb 8th)
Temperature data covers calender month
Degree days as used, is the sum of degress between mean outside temperature and 65° F.
⊛ Weather strips (CHAMBERLAIN) installed June 1928.
◎ Electric heat installed Jan. 17-1930. Gas pilot light only burned, except ten hours for heating basement.

SUMMARY

YEAR	DEGREE DAYS	COST IN $	CU. FT. GAS
1925	3895	148.23	260,500
1926	3470	155.45	261,000
1927	4424	178.65	309,400
1928	4309	155.05	267,900
1929	4620	152.51	262,000

SPACE HEATED

1ST FLOOR	= 6996 CU. FT.
2ND "	= 6647 " "
TOTAL	= 13643

Table No. IV. Operating data on gas for past five years

TABLE NO. I

Date	Time of Day	Kw.-hr. Meter Reading	Mean	Outside Temp. at Time of Reading	Remarks	Room Temp.
1-17-30	6:30 p.m.	00	16	14	Start of test	70
1-18-30	8:30 a.m.	130	16	14	Heaters on 2:30 a.m.	64
1-18-30	6:30 p.m.	283	16	17	East wind	72
1-19-30	9:30 a.m.	401	21	20	East wind	69
1-19-30	6:30 p.m.	505	21	20	East wind	70
1-20-30	8:00 a.m.	591	21	20	East wind (furnace)	62
1-20-30	6:30 p.m.	620	21	20	East wind High	79
1-21-30	7:30 a.m.	691	20	16	East wind High	60
1-22-30	8:00 a.m.	960	18	16	East wind High	65
1-22-30	6:10 p.m.	1155	18	17	East wind	75
1-23-30	8:00 a.m.	1258	22	22	East wind	60
1-24-30	8:00 a.m.	1549	26	22	East wind	68
1-25-30	8:00 a.m.	1847	26	18		
1-25-30	5:30 p.m.	1980	26	32	No wind	
1-26-30	9:00 a.m.	2082	26	26	No wind	
1-26-30	5:00 p.m.	2198	26	33	No wind	
1-27-30	7:30 a.m.	2300	32	30	No wind	
1-27-30	6:30 p.m.	2408	32	30	No wind	
1-28-30	7:30 a.m.	2490	27	28		
1-28-30	6:30 p.m.	2658	27	32		
1-29-30	7:30 a.m.	2720	33	35		
1-30-30	7:30 a.m.	2940	34	38		
1-30-30	6:00 p.m.	3038	34	38		
1-31-30	7:30 a.m.	3110	41	38		
1-31-30	6:00 p.m.	3198	41	43		
2-1-30	8:30 a.m.	3258	54	52		
2-1-30	5:30 p.m.	3309	54	54		
2-2-30	9:00 a.m.	3351	47	48		
2-2-30	7:00 p.m.	3428	47	46		
2-3-30	7:30 a.m.	3479	42	48		
2-3-30	6:00 p.m.	3570	42	44		
2-4-30	8:00 a.m.	3625	51	42		
2-4-30	6:30 p.m.	3688	51	53		
2-5-30	8:00 a.m.	3735	46	50		
2-5-30	6:00 p.m.	3788	46	46		
2-6-30	7:30 a.m.	3855	40	34		
2-6-30	6:30 p.m.	3961	40	48		
2-7-30	7:30 a.m.	4005	47	49		
2-7-30	7:30 p.m.	4102	47	43	Heater in living room changed from 2,500 to 4,000 watts.	
2-8-30	8:30 a.m.	4160	37	34		
2-8-30	6:00 p.m.	4242	37	40		
2-9-30	9:00 a.m.	4320	42	34		
2-9-30	6:00 p.m.	4398	42	44		
2-10-30	8:00 p.m.	4430	47	46	Furnace on to heat basement.	
2-10-30	6:30 p.m.	4442	47	48	Furnace on to heat basement.	
2-11-30	7:30 a.m.	4465	42	40	Furnace on to heat basement.	
2-11-30	6:30 p.m.	4465	42	41	Furnace on to heat basement.	
2-12-30	7:30 a.m.	4488	42	41	Furnace not turned on today.	
2-12-30	6:00 p.m.	4578	42	44		
2-13 & 14			46 & 55		No readings.	
2-15-30	8:00 a.m.	4855	52	46		
2-15-30	6:30 p.m.	4808	52	56		
2-16-30	6:30 p.m.	5005	54	57		
2-17-30	7:30 a.m.	5022	56	48		
2-17-30	6:30 p.m.	5075	56	58		

Total number of days, 31.
Total kw.-hr., 5,075.
Average kw.-hr. per day, 164.
Total degree days, 898 from 1-7 to 2-17-30.
Kw.-hr. per degree day, 5.65.

in the monthly load factor for house heating, making this load somewhat unattractive to the central station, even at higher rates than are offered for service on more uniform monthly load factors. However, the need for more accurate data on house heating was felt, and enough portable heaters were installed in my house last January to heat it completely, and sufficient data on kilowatt-hours and temperatures were kept to produce some interesting basic information on this subject.

Heaters Used

The heaters used were the 2,500-watt and 4,000-watt floor model "Thermador" heaters manufactured by the Hoffman Specialty Company, Waterbury, Conn., similar to the heater shown in Fig. 1. These heaters are constructed with a small vertical shaft motor driving a fan which takes its suction from underneath, drawing air through heating coils mounted around the motor, and discharging hot air out on all sides of the heater from beneath the top cover. With this fan circulating the air in the room, the heat is quickly and thoroughly distributed over a comparatively large area.

Construction and Heating Details

The first-floor plan of the house in which this experiment was conducted is shown in Fig. 2; the second-floor plan in Fig. 3. The construction of the house is wood frame, double wall, cement stucco outside, plaster inside, with two layers of common building paper under the outside lath. The floors are double thickness with 13/16-in. oak on 1-in. shiplap. The roof is wood shingle. The house faces north, and the garage and passageway, being on the east side, offer considerable protection on the first floor from severe east winds experienced during the colder period of our winter season.

These plans show the location and size of the eight portable heaters used, as well as the location of the recording thermometer. They also show door and window sizes, making possible the calculation of heat losses.

The cost of wiring for the eight heaters, including all circuits, cabinet, and panel board was $165. The heaters themselves retail for approximately $385, making the total cost $550, or somewhat below the cost of the gas heating system in this home. The gas furnace has eight warm-air lead pipes.

Thermostatic control was provided on the heater in the living room only. I believe that thermostatic control should be provided in all rooms on electric heaters and that a considerable saving in kw.-hr. consumption could be effected by the use of individual thermostatic control.

It is my opinion that heaters No. 1 and 2 should have been 4,000-watt capacity instead of 2,500, as some difficulty was experienced in bringing these two rooms up to temperature in the cold period during the latter part of January.

TABLE NO. II

Kw.-hr. Consumption, Mean Temperature, etc., for J. C. Plankinton's Residence, 1000 Claybourne Ave., Portland

Date 1930	Time	Kw.-hr. Meter Reading	Outside Temp.	Mean Temp.
2/17	6:30 p.m.	5075	58	56
2/19	7:30 a.m.	5200	52	56
2/20	8:00 a.m.	5309	46	50
2/23	9:00 a.m.	5658	42	42
2/25	6:30 p.m.	5981	44	42
2/28	6:30 p.m.	6358	48	42
3/3	8:00 a.m.	6688	44	46
3/5	8:00 p.m.	6958	46	48
3/11	7:30 a.m.	7570	40	51
3/13	7:30 p.m.	7848	41	42
3/16	9:00 a.m.	8130	47	50
3/17	7:00 p.m.	8288	57	52
3/18	6:30 p.m.	8368	54	52
3/19	7:30 a.m.	8400	50	46
3/20	7:00 p.m.	8605	46	48

Total number of days, 31.
Total kw.-hr., 3,530.
Average kw.-hr. per day, 114.
Total degree days, 571 for period from Jan. 17, '30, to March 20, '30.
Kw.-hr. per degree day, 6.2.

TABLE NO. III

Kw.-hr. Consumption, Mean Temperature, etc.

Date 1930	Time	Kw.-hr. Meter Reading	Mean Temp.
3/20	7:00 p.m.	8605	44
3/21	7:30 a.m.	8621	47
3/29	6:30 p.m.	9162	48
3/31	6:00 p.m.	9263	45
4/4	8:00 a.m.	9500	53
4/5	8:30 a.m.	9572	61
4/8	8:00 p.m.	9752	52
4/10	6:30 p.m.	9795	56
4/16	8:00 a.m.	9880	50
4/16	8:00 a.m.	9989	51
4/17	8:00 a.m.	10045	53
4/17	6:00 p.m.	10065	—
4/27	2:00 p.m.	10315	52

Total number of days, 38.
Total kw.-hr., 1,710.
Average kw.-hr. per day, 45.
Total degree days, 367 for period from March 20, '30, to April 27, '30.
Kw.-hr. per degree day, 4.7.

TABLE V

	Average Past Five Years			Estimated from Test Data				
	Degree Days*	Cubic Ft. Gas Consumed	Cost of Gas Used	Cubic Ft. Gas Per Deg. Day	Total Kw.-hr. Required	Kw.-hr. Per Deg. Day	Electric Load Factor	Rate Per Kw.-hr. to Equal Gas
January	780	52,600	29.61	67.4	4,228	5.42†	29.0%	7.0 mills
February	589	39,200	22.23	66.5	3,328	5.65†	22.8%	6.6 "
March	488	31,400	18.01	64.3	2,625	6.20†	18.0%	6.8 "
April	359	17,760	10.72	49.4	1,687	4.7 †	11.5%	6.3 "
May	194	6,150	4.59	31.7	892	4.6 †	6.1%	5.1 "
June	90	1,200	1.51	13.3	270	3.0	1.9%	5.6 "
July	13	00	00	00	0	0	0	—
August	20	300	.30	1.5	0	0	0	—
September	107	10,400	6.75	97.2	503	4.7	3.4%	13.0 "
October	269	23,200	13.65	86.2	1,480	5.5	10.0%	9.2 "
November	521	38,400	21.86	73.7	2,970	5.7	20.3%	7.4 "
December	714	51,600	28.94	72.3	4,034	5.65	28.0%	7.1 "
Total for year	4,144	272,210	158.17	65.7	22,017	5.31	12.4%	7.1 "

Total connected load 20.25 kw.
100% load factor (720 hrs. month)—14,580 kw.-hr. per month.
Average cost per 1,000 cu.ft. gas—58 cents.
*The term "degree day" represents the product of temperature (expressed in degrees) deficiency below a predetermined satisfactory minimum figure, usually 60-65 deg., multiplied by the time (expressed in days) that such temperature deficiency exists.
† Kw.-hr. per degree day taken from test data.

It will be noted from the floor plans that the wattage of heaters used ranged from 1.24 to 2.81 watts per cubic foot of space heated, with an average of 1.49 watts. It is evident that this is somewhat low. I would not recommend that the capacity of heaters be such as to provide a minimum of 1.7 to 2 watts per cubic foot for Portland weather conditions.

Kw.-Hr. and Temperature Data

Tables I, II, and III give considerable detailed data on temperatures and kw.-hr. consumptions. The average daily kw.-hr. consumption for the period from March 20 to April 27 was 45 kw.-hr. per day, while the average from Jan. 17 to Feb. 17 was 164 kw.-hr. per day. The highest daily consumption was 298 kw.-hr., indicating 15 hours' use of the entire 18.75-kw. capacity of heaters installed at this time, the heater in the living room having been changed from 2,500 to 4,000 watts on Feb. 7.

Table IV gives operating data on gas for the past five years. It will be noted that January, 1930, was very much colder than the same month in any previous year, having 1,141 degree days (see note foot of Table V) against the highest previous of 961 for January, 1929.

Table V shows average degree days, gas consumed, and its cost as taken from Table IV, together with a calculation of electric consumption estimated from the test data and based on average degree days as experienced in the past five years. The kw.-hr. per degree day were obtained for the first five months from actual test. The monthly consumption in kw.-hr. was obtained by multiplying the average monthly degree days by the kw.-hr. per degree day.

Portland gas has a B.t.u. value of 570 per cubic foot. Calculating from this figure and 3,412 B.t.u. per kw.-hr., the yearly consumptions in Table V are found to indicate an efficiency on a B.t.u. basis of 50 per cent for gas compared with electricity.

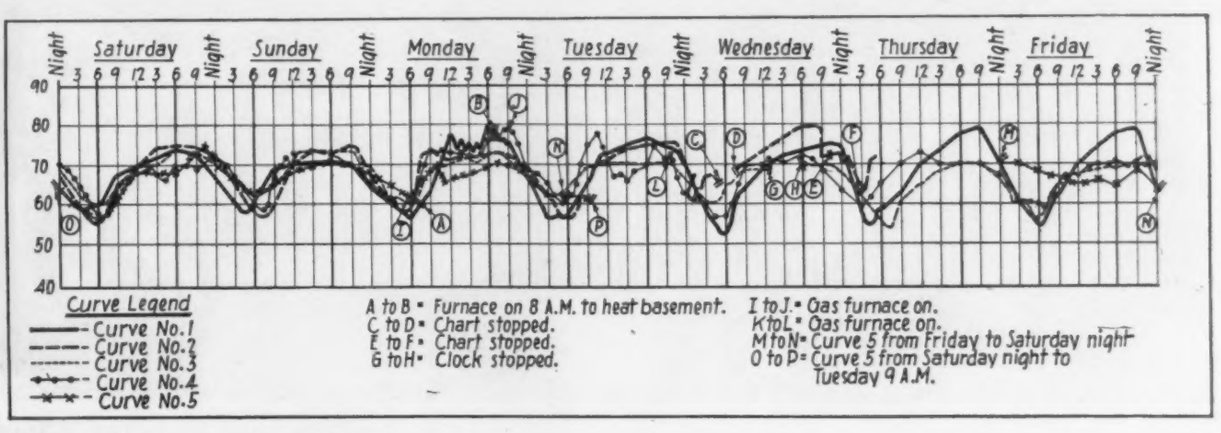
Load Factor and Operating Characteristics

Yearly load factor for electricity as shown is 12.4 per cent, which compares favorably with the yearly load factor of many other types of load. This is equivalent to three hours of use of connected load every day in the year, which undoubtedly is much higher than for residential lighting and cooking. The monthly load factor for lighting and cooking, however, is far more uniform from month to month and does not have the extreme seasonal peaks to be experienced with house heating. The diversified demand for lighting and cooking would, no doubt, be much lower for a given connected load than for house heating, probably as much lower as 4 or 5 to one.

The rate per kw.-hr. to equal gas at 58 cents per 1,000 cu. ft. is shown to be 7.1 mills, which is equivalent to the rate received for flat rate water heating at $5 per kw. per month. Of course, flat rate water heating service has a load factor much higher than that of house heating; in fact, it closely approaches 100 per cent.

Curves on Fig. 4 are temperature curves showing continuous temperature maintained in the living room from Jan. 17 to Feb. 18, 1930. On Curve 1 it will be noted that the temperature pick-up in the morning was somewhat slower with electricity than with gas (the gas furnace was turned on in the morning of Jan. 20 and off the evening of the same day), although this would not have been the case had a 4,000-watt heater been in use in this room at the time this chart was taken.

Fig. 4. Curves show continuous temperature maintained in living room Jan. 17 to Feb. 18, 1930



It should also be noted that outside temperature was from 12 to 20 deg. during the time Curve 1 was taken. The point at which the temperature curve starts to drop shows the time the heaters were turned off each night. From this time to the time when the curve starts up again the chart reveals the loss in room temperature during the night. This, I believe, indicates fairly good insulation in this room.

All the heaters in the house were turned off every night with the exception of some that were left on "low" a few nights during the coldest weather.

Summary and Conclusions

My conclusions after studying the data obtained from these tests are as follows:

1. That this type of heater is very effective.

2. While I cannot recommend electricity for primary house heating for climatic conditions such as prevail in Portland because of the necessity of making too low a rate to meet the competition of other fuels, for a load that is unattractive because of its poor load factor, I do feel that there is a field for auxiliary house heating business to be had at prevailing residential rates. No doubt in territories where climatic conditions are less severe, complete house heating can be successfully done by electricity at rates satisfactory to the central station.

3. The following statements give a summary of the pertinent facts learned from this test:

Wattage capacity of heater required per cubic foot space to be heated is 1.7 to 2 watts.

Kw.-hr. per degree day yearly average is approximately 5.31.

Gas efficiency on basis of B.t.u. is approximately 50 per cent of electric efficiency.

Separate thermostatic control of each heater is advisable.

Rate per kw.-hr. for electricity to equal gas at 58 cents per 1,000 cu.ft. is 7.1 mills.

Yearly load factor of electric heating is approximately 12.4 per cent.

Monthly load factors vary from zero to 29 per cent.

Maximum demand will be full connected load of heaters.

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Now---The Outdoor Baking Bee

World's First Open Air All-electric Contest Held at Isleton (Calif.) Festival

"OH, MAMMA, see the circus. There's the fat lady, mamma. Where's the snake charmer?"

"Be quiet, Johnny. That's no circus. It's just another baking contest."

Isleton's now famous baking contest, held in that California city during the annual asparagus festival in June, was the first culinary exhibition ever conducted in circus style. Never before, as far as is known, had the contestants, 97 in number, used the same ingredients in the same amounts on the same stove before the same audience in an attempt to bake the same products. And what a success it was!

Isleton, situated as it is on the Sacramento River and in the heart of the asparagus valley, seems to have but one thought all year, the big asparagus festival. Isleton is a sort of asparagus capital to which every year, during the carnival, come hundreds of visitors to augment the city's 800 inhabitants.

The Chamber of Commerce manages and directs the festival. This year, J. W. Gardiner was appointed chairman of the committee; with him rested the job of thinking new ideas and planning new stunts. And in an especially brilliant moment, Mr. Gardiner conceived an outdoor baking contest. The sales department of the Great Western Power Company, which is the representative for L. & H. ranges, and the General Electric Refrigerator

Part of the crowd which saw Isleton's outdoor cooking contest during the biscuit baking finals on Saturday, June 7. The ten electric ranges and ten electric refrigerators used in the festival did much to impress spectators with the neatness of an all-electric kitchen

The cake baking contest on Sunday drew the largest number of entries—56; it also drew the largest audience. The staging of this affair, said to be the first of its kind, was the work of territorial representatives of the electrical appliances used

Company, were asked to manage the affair and were given full rein in staging the program.

The contests were held on a long platform 2 ft. from the ground and 90 x 10 ft. wide. An 8-ft. rear wall was constructed as a shield against the wind, and ten large carnival umbrellas protected each of the ten model kitchens from the sun. The location selected for the contest was at one end of the main street in the town square where traffic could be by-passed by roping off a section of the main highway. This location made it possible for all through traffic, both north and south, to observe the setting.

The space thus provided was divided into ten electric kitchens each containing an L. & H. electric range, a General Electric refrigerator, a white porcelain kitchen table, and such working equipment and supplies as were required. A master kitchen, provided with a maid to assist in washing equipment, a full set of Peerless cabinets, and a sink with hot and cold running water, was placed in the center of the platform.

Simple biscuit and cake recipes, as shown on the opposite page, were advertised and a prearranged set of rules was made. A maximum of 120 contestants was provided for. The biscuit baking contest was to be held from 2 until 5 p.m. Saturday afternoon, and the cake contest from 2 until 7 p.m. Sunday.

A supervising attendant was provided for each side of the platform, each attendant to have five ranges under her care. On Saturday afternoon 41 women entered the biscuit baking contest; 56 entered the cake contest on Sunday. Entries were judged by domestic science teachers from Oakland and Sacramento on the basis of texture, taste, color, and appearance.

Ten prizes, consisting of an L. & H. range, a Hotpoint electric cooker, three electric heaters, three electric irons, and two electric table timers were awarded each afternoon. Those contestants who failed to win prizes were given market baskets full of food products donated by interested concerns. Thus every entrant received something for her efforts.

The value of the two first prizes undoubtedly did much to arouse interest in the contest. However, much friendly rivalry appeared between the participants to produce the best biscuits and cakes and the procedure was observed each afternoon by a large audience.

Electric equipment was used throughout and resulted in much indirect good to the companies represented. Many women who had never before used electric ranges were among the winners and were pleased with the success of their electrically baked products. The disposition of several ranges, including the two prize stoves, more than recompensed the distributing company for efforts expended in handling the contest.

Of the success of the contest, Harry Lippert, territorial representaive for the Lindemann & Hoverson Company, was enthusiastic. "If we are to judge from the interest displayed both by participants and spectators," he averred, "there will be many similar contests held all over the country and copied after Isleton's venture."

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Cold Storage on Farms Offers Fertile Field

Although the cold storage box, larger than an electric refrigerator, has a diversified use on farms and has proved highly satisfactory to its owners, the refrigerating agencies and public utility companies have failed to take advantage of this field, a report of the California Committee on the Relation of Electricity to Agriculture, just published, shows. As a result of the lack of interest by companies, those few who have a general utility cold storage box have obtained it by request rather than by having it sold to them.

Findings of the committee point to a clear road in the selling of refrigerating units to farmers and ranchers. Economical in cost—the report showing that the operation of a large walk-in type of box costs but one-quarter as much as ice—the plants also save money for the users by allowing them to buy meat in quarters or halves at wholesale prices, storing it in the box until used.

Farmers may dress their own meats, especially pork, at a cost of 16 cents, whereas it would otherwise be purchased from shops at 40 cents.

As a final word, the report stressed the importance of having power company employees circulate among farmers with information on the advantages of the general utility cold storage plant.

A Frank Statement From the Contractor-Dealer Group Which Opens Up Questions on Merchandising Policies and Practices That Require Equally Frank and Satisfactory Answers

Parallel Merchandising Interests Needed

A senseless squabble which the buying public views with disgust

ONCE upon a time there was a great army composed of several allies. Each army was trained and equipped for a particular type of warfare. In its class, each was an impressive fighting unit.

This combined army was about to engage in a grueling struggle with an enemy of great cunning and resourcefulness. Officers of the four armies met in a wordy council of war. They devised and discarded various plans of action. Each division commander had a theory which in his estimation was supreme. No one of them could see much virtue in the ideas of the others.

So the council broke up and each division went forth by itself to do battle with the common enemy. There was no co-ordinated plan of campaign and there was no interchange of information between units. Each, self-confident in its own strength, coveted all of the spoils and all of the glory for itself. Petty rivalry and strife broke out between the commanding officers and the troops of one army and those of another. Then came the stage during which the rivalry became so keen that each army fought the other for the preferred position in the front line trenches. Instead of meeting the common enemy, the war became a dog fight, every ally, every man for himself, and the cause for which they had first combined forces was lost.

Ridiculous, you exclaim, armies just aren't run that way.

Military armies—no. But how about industrial armies?

How about the great army of the electrical industry, to bring it closer home? Of course, it does not see munitions wasted, men slaughtered or blood lost, but it does see time and materials wasted, men discouraged, bad blood and disorganization everywhere. Does not our own industry present a spectacle of this kind?

In reality, are not its four divisions, while outwardly pretending to co-operate, actually throwing dust in each other's faces. We meet and confer, we plan and resolve; and, as invariably as we go forth, each goes out to vilify and exploit the other, with the result that the morale of the industry is at the breaking point.

There are no new facts and no new thoughts recorded in the foregoing analogy. Its whole purpose has been to emphasize the folly of existing relations between component parts of our industry. Because the interests of the individuals and the officers in the allied army during the World War were parallel, co-ordinated, the cause was finally won against an enemy whose organization was perfect. But during the long years until these interests were made parallel, there was not much success in even the allied cause.

We hold that the same principle is involved in the relations of the various branches of our industry. We hold that the interests of the power company and its salesmen and the interests of the dealer must be made parallel before we can march together to ultimate victory in the electrification of home and industry.

Your committee, in approaching the subject of central station relations, has for the moment omitted the manufacturing and distributing groups. This discussion will be confined to the central stations on the one hand and the dealer group on the other.

"Central station group" needs no definition, but the "dealer group" today has a far different significance than formerly. Once they were thought of as a handful of comparatively small electrical contractors and dealers. Today, they embrace not only these, but likewise include the hardware dealers, the household equipment concerns and the big department stores. Even the mail order house is actively engaged in the merchandising of electrical equipment of one kind or another, and must not be ignored.

Despite any publicity to the contrary, not one member of either central station or dealer group was prompted by altruistic motives to enter business. Each had, and still has, the possibility of material gain uppermost in his mind. We present day mortals "love our work" just in proportion to the money there is in it for us.

We will pull together so long as we get our share of the profits, and we will pull apart just as soon as our chances for material gains are impaired.

Therein lies our community of interests, and any plan of mutual assistance must be built on the premise of "profit for all."

Since focusing its attention on this subject, your committee has asked questions among the dealers in all parts of southern California, from Tulare to San Diego. Added to this, unsolicited expressions of dealers' sentiments have come from the East and the North.

A Cross Section of Sentiment

There is a surprising similarity between these geographically widely separated reports. Therefore, we present the following as a reasonably accurate cross section of dealers' sentiments, at least in southern California.

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Answering the Electragists

Invited to Comment by ELECTRICAL WEST, Several Central Station Men Express Themselves Frankly on the Problems Stated by the Electragists on the Facing Pages

Co-operation Not Competition

By A COMMERCIAL MANAGER

FAILURE of the central stations to avail themselves of every possible outlet for the sale of electrical appliances is a grave error in judgment. Merchandising of electrical appliances, particularly in respect to power company activity, is in a transitory stage. Ten years from now we will be able to look back upon conditions today and marvel that the problem of increasing the load on our lines was not solved more quickly and more successfully.

The day when the gas companies thought it necessary to give away a gas stove to every new consumer is within the memory of all of us. We all remember when the electric power companies sold motors and did the wiring. These, in their day, were serious problems. However, through evolution and development, they have taken care of themselves. Dealers grew up, wiring and engineering concerns developed, and the power companies no longer find it necessary to sell motors or conduct wiring departments.

Fundamentally, the sale of equipment is purely incidental to power company growth. Yet it has been necessary for the companies to pioneer the sale of certain devices in order to stimulate increased use of electric power. Electric cooking, water heating and air heating are the only remaining services that require pioneering and promotion by the central stations. And in many sections of the country the results achieved in merchandising ranges and water heaters are not commensurate with the effort that is being expended, simply because sound merchandising principles are not being followed.

Certainly central station salesmen should not be in competition with other dealer outlets. To permit this and at the same time to endeavor to develop these other outlets to their fullest capacity is simply to court trouble. I firmly believe that if merchandise or appliance salesmen were placed on a salary plus bonus based upon the earning value to the power company of the load added, then much of the present trouble would be eliminated. If in certain territories dealer outlets have not been developed which will aggressively merchandise the equipment and appliances on which the power company is concentrating, then the central station is justified in selling direct to the consumer. However, both price and policy should be such as to stimulate outside dealers to go into the business and to co-operate with the power company in the development of this load.

I recognize that no hard and fast sales plan or policy can be laid down on account of the variable conditions that exist in different territories. However, the power companies need friends, and every possible effort should be made to secure the complete and wholehearted co-operation of all classes of dealer outlets. In this way the companies will add to their sales forces a large number of salesmen whose compensation will come from the profits secured through merchandising. If the power companies feel that the time will ultimately arrive when it will no longer be necessary for them to merchandise any appliances, then they should bend every effort today to develop adequate dealer outlets. Certainly this cannot be done with merchandise salesmen working in direct competition with these dealers.

Fair Competition Increases Appliance Business

By GEORGE T. BIGELOW

Assistant General Agent, The Southern Sierras Power Company, Riverside, Calif.

ONE MERCANDISING rule or one merchandising policy can never be made to apply to all territory. This is noticeably true on our system, as in some instances the territory is so scattered and barren that it cannot attract anyone with capital enough to put in a first-class appliance store or do a general electrical merchandising business. The volume does not exist. Most of such territories can only support a wireman, and in every in-

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Red Seal Plan—We believe that the Red Seal Plan is not being given the support it merits—at least not visibly. This standard of wiring is maintained and in many cases is exceeded, but Red Seal applications are not being made in the number which the excellence of the plan deserves. There is a very definite reason for this apparent lack of contractor-dealer support. His chances of personal gain through the sale of ranges and water heaters is impaired if he lets it be known that he is wiring such a job. Particularly is this true in localities where the central station is taking applications and making inspections. Filing of a Red Seal application is an open invitation to the central station salemen to come on the job in competition with the dealer. And such competition!

While the California Electrical Bureau had an independent field staff of inspectors to check up on the Red Seal jobs, there was faith that the interests of the contractor-dealer would be protected. But now, without a field staff, without a disinterested third party to make the inspections and handle the transactions, and in its place a very much interested, and not always ethically careful power company, is it to be wondered at that the applications are not made as they should be?

This is one instance of the fact that the interests of both dealer and power company sales force are not parallel. The result is a loss to the industry.

Salesmen's Tactics—From all parts of southern California, our informants say they do not fear fair competion. They do object strenuously, however, to the brand of competition that holds them up to their customers as a class of business of little or no financial stability, and with a "mortality rate" so high as to be a menace, even to a six months' purchase contract. Neither have they found anything to cope with arguments regarding "pole line extensions" and "perpetual service." These terms are too well known to need further explanation here. More instances of lack of parallel interests between dealer and power company salesmen!

Another practice bitterly complained of is the setting up of false ideas of wiring costs in the minds of the public and of central station employees. This is done by the too common practice of turning range and other wiring jobs over to contractors, who, from ignorance and lack of business ability, take them at ruinous prices. These men substitute inferior quality, for as long as they can hold out, and then, because of this as much as anything else, pass on to swell this "mortality rate" which the power company's salesmen describe. Is it not a part of the central station's responsibility to its public to do what it can in support of a dealer group which will be permanent and a credit to the industry? Is this not another instance in which the interests of the Electragists and of the central station should be parallel?

"All of these questions, and more, are being asked by dealers, far and wide. Someone must answer them completely, accurately and satisfactorily, or suspicion and distrust may grow and spread beyond control"

Akin to these, are the practices of central station missionary salesmen working on air heating jobs. So zealous do these men become in their anxiety to demonstrate the economy of electric heat over and above any other types of fuel, that they prepare estimates based on dealers' wholesale costs for heaters and a wild guess, generally ridiculously low for the wiring. Hence, again the dealer's chance for profit is impaired and once again his "love for his work" takes a slump.

Selling on Competitors' Lines—Inquiries of the committee have brought to light instances of one central station selling and servicing ranges on the lines of an adjoining company on exactly the same terms as are offered its own consumers.

Believing, as they do, that central station merchandising operations are not self-supporting, dealers cannot be blamed for asking, "Is this practice fair to the power company's other customers, and its stockholders?" meaning in reality, "Is it legal under the Public Utility Act?"

Price Cutting—Nominally, list prices on ranges are being maintained by central stations. Yet a price cut by another name smells just as bad. In reality, what amount to price cuts to the point where the dealers' chances for profit are impaired are to be found in the following:

1. Disproportionate trade-in allowances for worthless cooking equipment.
2. Special premiums as an extra inducement.
3. Wiring at or below cost.
4. Terms.
   (a) The old equipment liberally appraised as a down payment.
   (*b*) Balance extended over eighteen months.

When such zeal for time paper is demonstrated by central station merchandising organizations, is it any wonder that from many districts this committee has heard asked the question, "Can it be that central station executives independently own substantial interests in such finance companies and that this fact influences long term finance policies?"

Another question which cannot be downed is this: "If central stations consider it necessary—and perhaps they are entirely right in considering it so—to extend terms as long and with as strong inducements as they do, why do they not place the same facilities for terms at the disposal of contractors and dealers and have them act for them as an enlarged and volunteer sales force?" Again, a lack of parallel interest!

Legality—More and more the question of the legality of the whole central station activity crops up. It is asked:

1. Is it legal for a protected monopoly to engage unrestrained in open competition with the unprotected dealer?
2. If the central stations were forced to divorce their merchandising operations entirely from their utility activities, using a separate building away from their col-

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"As individuals, and as an organization, the Electragists have never considered that government ownership was desirable. As staunch individualists, contractors believe in the superiority of individual business enterprise and initiative. The industry at large should go far in its efforts to correct conditions which show a distressing tendency to drive men, otherwise minded, to political ownership of utilities as a last resort in a desperate stand for their own right and survival"

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stance this kind of work is turned over to that wireman by our company. We ourselves do no wiring.

On air heating installations of any size at all, we always turn the job over to the manufacturers to work out with their dealer, our men giving all the help they can, but not attempting to sell any equipment. We do not and never have sold on competitive lines. We are very strongly opposed to such a practice.

Price cutting has no place in a central station merchandising policy. We sell all equipment and merchandise at list price. We do have campaigns, and it is only in these campaigns that any trade-in allowances are made or premiums given. We believe that this is in accordance with general merchandising practice by most merchandisers, who are far more experienced than the central stations. If this is the case, I see no reason why this should not be done by dealers as well as ourselves, particularly in sales stimulating campaigns. We believe that sound merchandising is certainly not unfair competition.

Old equipment is never taken in as a down payment. The purchaser must make a down payment, and in our case this must be at least 10 per cent. Terms are not extended longer than twelve months, except in the case of refrigerators where eighteen months' terms are allowed. This company up until 1930 had insisted upon twelve months' terms and the payment period on refrigerators was only extended to meet the competition of other refrigerator outlets.

Our company watches very closely the merchandising costs, and our management demands that merchandising profits shall pay the expense of all merchandising activities.

We do not believe in the commission form of payment for salesmen. We have always paid straight salaries as we do not believe that high-pressure selling and good public relations can go hand-in-hand.

We believe that by operating under the conditions outlined we are being fair with the dealer. We do believe that if the consumer is to obtain the greatest benefit and convenience from the use of electric service, then there must be competition in the sale of electrical appliances. Central station merchandising and sales promotion, when conducted on an ethical basis, means more business for everyone. At various times we have tried, in certain localities, the practice of turning all of our prospects over to the dealer. We have found that in these cases the volume of sales dropped off, and when we stepped back into the picture, the volume of sales increased. While the power company obtains the revenue from the kilowatt-hours used by the equipment sold, it must also be remembered that the dealer usually has added wiring from which he may derive a profit.

From their reports the dealers admit they believe in the American principle of individual initiative and, as a matter of principle, are opposed to any state ownership scheme. It would scarcely seem logical that they can better themselves by adopting any principle which they do not believe is sound.

Follow the Golden Rule

By H. H. COURTRIGHT

President and General Manager, Valley Electrical Supply Company, Fresno, Calif.

IN MY OPINION the chief cause of all present-day misunderstanding between the central stations and the retailers of electrical merchandise is that too often they forget the golden rule: "Do unto others as ye would have them do unto you."

And that goes for both parties in the conflict!

First take the central station.

The central station primarily sells no commodity, it sells a service. It produces that service as it goes along to make its business pay. If its sales fall below a certain point it rapidly loses money, for its overhead remains the same within norrow limits. What is more natural then, than that the utility will put forth every effort to build up its sales to the full capacity of its power houses and thus make a financial success of its enterprise?

However, current can only be sold if the appliances are there which use it, and more current will only be used if the number of these appliances and the frequency of their employment increases.

Now, to leave the sale of these appliances entirely to an outside agency would be like telling a hungry man that he must not take food until someone else allows him to do so. A healthy and able man would not suffer himself to be thus dictated to, and in like manner it is of the most vital interest to the central station that in some manner it retain control of the flow of appliances onto its lines. But how to exercise that control —there is a difficulty.

The easiest way, from the utility's point of view, of course, would be to sell appliances at any cost, *with* merchandising profit, if this be possible, but without profit, should this be necessary. Paraphrasing Shakespeare, the utility might say, "The load's the thing," and go on its merchandising way without regard to the toes it stepped on. Unfortunately, in this complex society of ours the interests of others must be considered if one wishes to get along.

Then consider the dealer.

The dealer makes his living selling merchandise—at a profit. No profit—no living; not enough profit—scant living. Naturally, he resents any interference by the utility with what he considers his function in the economic structure. And he has every right to feel wronged,

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lection and other office facilities, for how long could they show a profit?

3. If central station district offices were solely for the purpose of accounting and bill collecting, would they need to be so pretentious in their merchandise display facilities and occupy such expensive sites?

4. How much of this extra equipment, rent, insurance, taxes, administration expense, and other items of overhead are charged to merchandising?

5. How much of this extra investment due to merchandising activities and how much of the capital invested in merchandise stocks is included in the valuations on which rates are based?

All of these questions, and more, are being asked by dealers, far and wide. Someone must answer them completely, accurately and satisfactorily, or suspicion and distrust may grow and spread beyond control.

The New Independence

Your committee members individually have heard scattered protests along the lines described in the foregoing before the committee was called together. The committee was wholly unprepared, however, for the storm of protest that has come to its ears in the past few weeks.

Casting about for the reason, we believe we have found it in what we choose to call "the new independence" among the contractors and dealers. Speaking of southern California, it is surprising to note the new sense of self-confidence, self-respect, and self-assertiveness born among our members during the recent months. Along with this has come an unprecedented growth in numbers and a realization of the fact that the interests of the larger merchandising outlets mentioned heretofore are coincident with our own, even if the central stations seem to feel that ours and their interests are not common.

The contractor-dealer or the local merchant is the last one in the chain of distribution. He is personally acquainted with the consuming public. He is the first and last person to whom the consumer comes for advice on things electrical. His recommendations often clinch or ruin a range or heater sale.

Is it not expecting too much of human endurance and patience to consider that if the dealers continue to be harassed by unfair and unethical practices on the part of the central station salesmen, no matter with what pretty phrases the executives of those companies enunciate their sales policies and denounce salesmen's methods, there will be first a distrust of the central station, then a lack of interest in electrical merchandise, and finally an antagonism which may be driven to retaliation if the condition continues?

What is the reason, pray, for the frequency of questions as to whether public ownership holds any relief from an intolerable situation? Why is it that more and more the dealer division is asking itself if this isn't the answer to many of its troubles? Why is it that more and more it is being discussed among our members, and why is it at this moment a very live issue in one locality? Who can tell what the collective dealer attitude might be if the question of state ownership came up again?

As individuals, and as an organization, the Electragists have never considered that government ownership was desirable. As staunch individualists, contractors believe in the superiority of individual business enterprise and initiative. The industry at large should go far in its efforts to correct conditions within the industry which show a distressing tendency to drive men, otherwise minded, to political ownership of utilities as a last resort in a desperate stand for their own right and survival.

In this situation, certainly, the interests of both are diverging very far from the parallel.

Conclusions

In bringing this paper to a close, this committee wishes to emphasize a few things as follows:

1. From now on, this industry must recognize the community of interest between its component divisions and must realize and guide its course accordingly, that any plan of campaign which does not provide equal opportunity for all and a profit for each will not succeed.

2. The dealer branch asks no charity and will accept no subsidy. It stands on its own feet as never before and demands the opportunity to earn a fair profit on its operations.

3. Reserving for the last what we consider the crux of the whole situation, there is this to be said. All of us have seen central station merchandising plans come and go. Some of them have succeeded. Most of them failed, from our viewpoint.

Merchandising managers have declared their intention, and have even instructed their salesmen to co-operate with the dealers. Dealers have been assured that violations of policy would be summarily punished. Yet, the individual human equation bound up in the person of the central station salesman has been enough to defeat the good intentions of the central station department heads, as long as this salesman's income depends upon the commissions earned on merchandise sold.

The interests of the salesmen for the power company and those of the dealers were not made parallel.

For this reason, all such plans have failed as far as industry relations have been concerned.

This condition will continue, and will grow worse from year to year, because basically it is unsound. Until someone devises a plan whereby the salesman profits only as the dealer profits, there must be waste, inefficiency, even war, between those who should and must be friends.

If a plan—any plan—is evolved which embraces this principle, one great step forward will have been taken, and two divisions of our great army will be well on their way toward a successful and co-ordinated objective, shoulder to shoulder, and step to step.

▼ ▼ ▼

New Milk Cooling Unit Designed for Warm Texas Climate

Designed especially for heavy duty in the warm Texas climate, a new type of Kelvinator milk cooling unit has been built by George Thompson of the El Paso Electric Company and E. A. Seibert of the Kelvinator Corporation. That the new unit is definitely filling an urgent need among dairymen and has reduced the milk cooling process by electrical refrigeration to a much more economical basis than before possible, is the word of the El Paso company.

Until the development of the new unit, aeration had been used by El Paso dairymen to comply with an ordinance requiring that milk be delivered at a temperature under 50 deg. F. The aeration method, while good, was too expensive for smaller dairies.

The refrigeration equipment, including a galvanized iron tank lined with 4 in. of sealed cork, refrigerating coils, and mercroid control, is made and assembled by the El Paso company. Cans of milk are partially submerged in an ice bath and cooled by use of this equipment. The economy of this type of installation is demonstrated by the fact that 2- to 12-can units are built to sell for from $350 to $900.

(Continued from page 79)

except that he in turn does not always consider the utility and its needs.

The dealer needs profit; but the utility needs load, and it so happens that the latter is as indifferent to merchandising profits as the former is to load increase. Now, what could be sweeter? Give them each what they want, and they'll both be satisfied.

If an impartial observer, one not connected with either branch of the industry, should analyse the situation, he would most likely come to this conclusion: The central station wants load, but cannot obtain a sufficient increase under a system of absolute non-participation in appliance merchandising. The dealer wants a fair profit on the goods he handles and a living income to pay him for his labors, but the buying public will most assuredly pass up his store if it can fill its needs elsewhere at lower cost. Also, dealers are not always so organized and financed that they are able to place in the homes of the consumers the large quantities of appliances which the utility constantly needs for healthy growth. It costs real money to advertise, demonstrate the use, force-feed and otherwise promote the sale of such blocks of current-consuming devices, and the regular trade discount does not allow such expenditures.

Conditions vary in almost every locality and every case demands a different treatment. But the following rules, if observed, should give improvement to any condition:

It has already been stated that the central station should lead in merchandising work. It should, in addition, assume the burden of experimentation, demonstration, advertising and educational work. It should recognize the established channel of distribution—manufacturer, jobber, retailer, consumer. It should consider itself the organizing head of a voluntary store chain, of which its own stores are but units having equal rights, as the stores of other dealers. It should endeavor to educate those dealers in salesmanship and under no condition take advantage of its own greater buying power and superior financial capacity.

The central station should organize all available retail outlets, electrical, hardware and general, and give to all the same measure of assistance and support.

The central station should advertise regularly over its entire system and should insert into those advertisements the names of all dealers co-operating with it in any one locality. The association of the power company's and the dealers' names will mean to purchasers the utility's endorsement of the advertised appliance and increase their confidence in the article offered.

The central station should never cut the price on a nationally advertised appliance, nor give a premium with such an appliance, which in effect would amount to a discount. It might embarrass the dealers if they had to explain the difference between the cut price and the regular list price which they commonly charge to their customers. The central station should so arrange its sales activities that appliances move onto the lines in a steady stream—not spasmodically in high pressure campaigns. It should avoid the use of large numbers of temporary salesmen who through the nature of their temporary employment make wild and unfulfillable promises to prospective buyers. Nor should the central station try to do 75 per cent of its yearly sales volume in 25 per cent of that year, leaving its own as well as the dealer's business to languish for the rest of the time.

The chief cause for dissension between dealers and the utility is that the latter does its merchandising on a basis whereby the sales profit is almost entirely paid to the salesmen in the form of commission. As a result, the salesmen endeavor to pile up as great a volume as is possible and only consider their personal interests in their daily work. It is much better that the power company should pay their men a basic salary large enough for ordinary living costs, and in addition, give a bonus based entirely on the amount of load secured within the district, regardless of whether this was the result of sales made by the utility's men, or by an independent dealer.

If the utility should remember that merchandising for it is only the means to an end—the increase of its load—it would readily see that sales volume as expressed in money does not mean anything, but that kilowatt increase is the yardstick by which the performance of its sales department should be measured. By taking load increase as the basis of its new business work, the utility secures for its salesmen the co-operation of all dealers, since in this way the gains are evenly divided, the merchant taking the sales profit and the utility getting the load.

To provide department store organization and to stimulate department store enthusiasm instead of the too frequent hit-and-miss merchandising methods of today—that is the task of the central station.

The dealer faces a task far less complex than the central station, though one equally as important.

He should first set his house in order and then keep it so. That means that he should conduct his merchandising in a business-like fashion, and, by proper methods of accounting, know the cost of the undertaking for the success of which he is responsible. Too many dealers fall by the wayside, not through central station competition as they are apt to think, but through their inacquaintance with even the fundamentals of accounting and their ignorance of modern business methods. "The overhead will get you, if you don't look out" may well be the dealers' theme song.

With the central station leading and the dealer co-operating, with the expressed desire on the part of both to "live and let live," there can be no strife, and the utility-dealer controversy will go to the limbo of forgotten things.

Construction

▲ Distribution practice in large buildings has been advanced a long step forward by the methods developed in the Shell Building. Simplicity, adequacy, flexibility, plus material savings in space and equipment, both of which mean economy, are to its credit. △ The architect was George W. Kelham, the builder P. J. Walker, the electrical and mechanical engineers, Hunter and Hudson, and the electrical contractor, Charles A. Langlais.

Golden amber light floods the building at night. It comes from 404 floodlights, mostly 1,000-watt units, on the building itself and on adjacent buildings. The distinctive color sets the building apart from everything else in San Francisco

Shell Building Pioneers a New Idea

By G. E. GARTHORNE
Electrical Engineer, Hunter and Hudson, Consulting Engineers

BECAUSE it embodies several distinct departures from usual standards and methods of electrical design in large commercial buildings, the new Shell Oil Company Building, at Battery and Bush Sts., San Francisco, towers above the city's rapidly changing skyline as something of a landmark both figuratively and electrically. It carries with it the distinction of being the first building in the West in which has been installed the low-voltage a.c. network system. This system, as applied to commercial buildings, has developed a new application of feeder design and load distribution, insuring a greater flexibility in distribution and an economy of feeder cost.

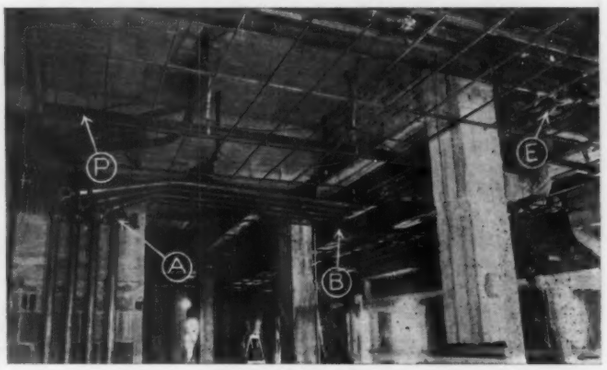
In the original contract between the Pacific Gas and Electric Company and the Shell Oil Company it was agreed that the former install a set of transformers on the roof to care for the elevator power load. This bank, together with the necessary switching equipment, was to be furnished by the power company.

At this time it was suggested by the engineers that the idea be carried a step further and that this bank be made a three-phase 120/208-volt Y-connected bank, tying it in with street mains and completing within the building the network system recently standardized by the Pacific Gas and Electric Company for the downtown district. This suggestion met with the approval of the power company engineers and was adopted. It was understood that the owner was to complete the secondary tie to the street network and install the primary feeder from the basement bulkhead to the roof bank. This involved a vertical riser of 380 ft. with horizontal runouts in the sub-basement and on the 28th floor.

It became necessary therefore for the engineers to work out the most practical and economical method of supplying high tension to the roof bank and making the secondary tie to the street mains. Space and location had to be considered since the economy of this system depended on locating the secondary tie as close as possible to the load center of each of the floors.

Such a location was selected. It consists of a shaft 18 in. deep by 6 ft. 6 in. wide at the end of one of the elevator banks. This shaft is continuous from the basement level to the 29th floor, opening into the main corridors on each floor above the first floor as a small closet provided with standard double doors. In this shaft is

The 28th floor during construction. The primary cable loops from its vertical riser conduit to the horizontal run (P). At (A) the vertical secondary buses are hung. They are connected to the transformer vault at (B). At (E) the elevator tap goes up to feed the elevator panel



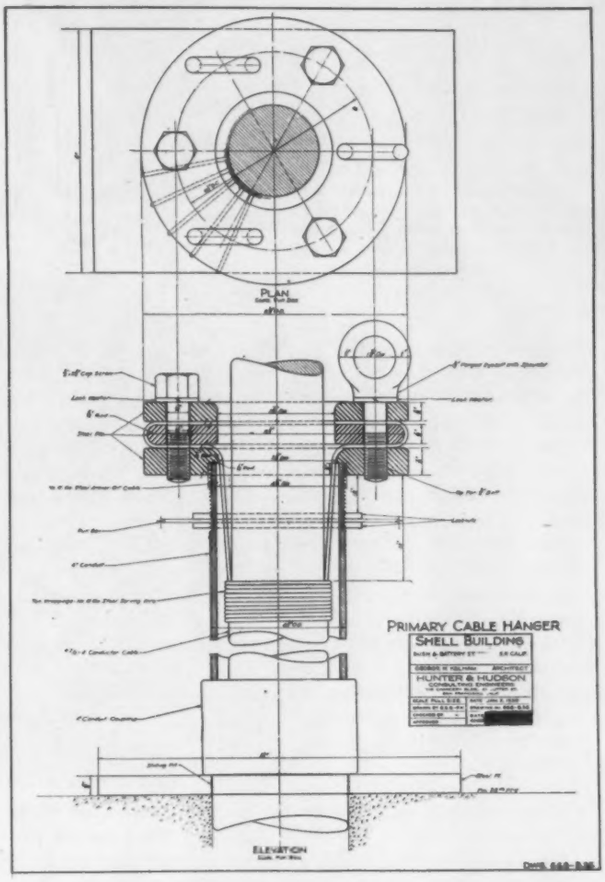
installed the primary feeder cable, the secondary bus tie, the combination light and power distribution panels, and all control and meter wiring.

Primary Cable

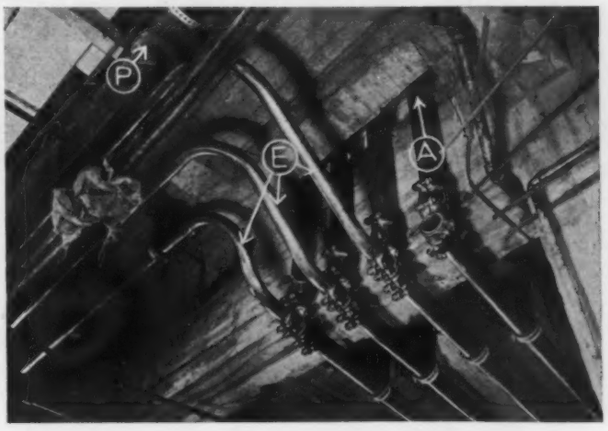
Next we were confronted with the problem of spacing and supporting both the primary cable and secondary buses through this shaft.

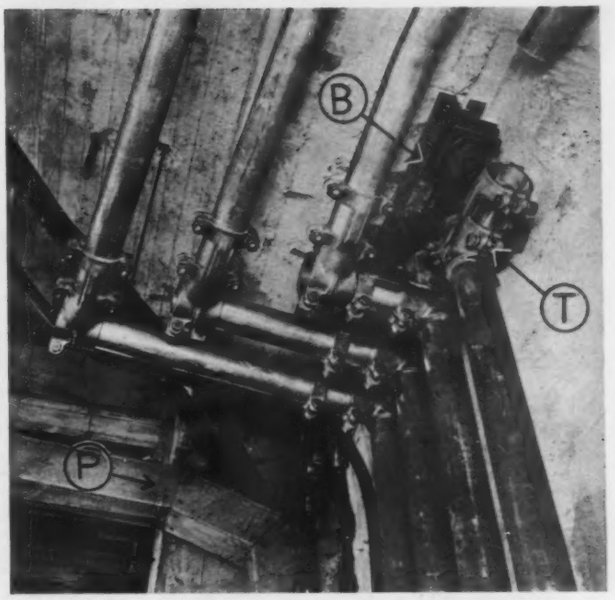
For the primary system two methods were considered:

1. The use of braided cable in conduit with pull boxes spaced at approximately 50 ft. on centers, at which



Below: *A close-up of the point at which the secondary bus system is tapped off for the elevator power. At (A) the buses come from the network protector and transformers. The elevator taps are (E). At (P) can be seen the primary conduit on its way to the transformer vault above*

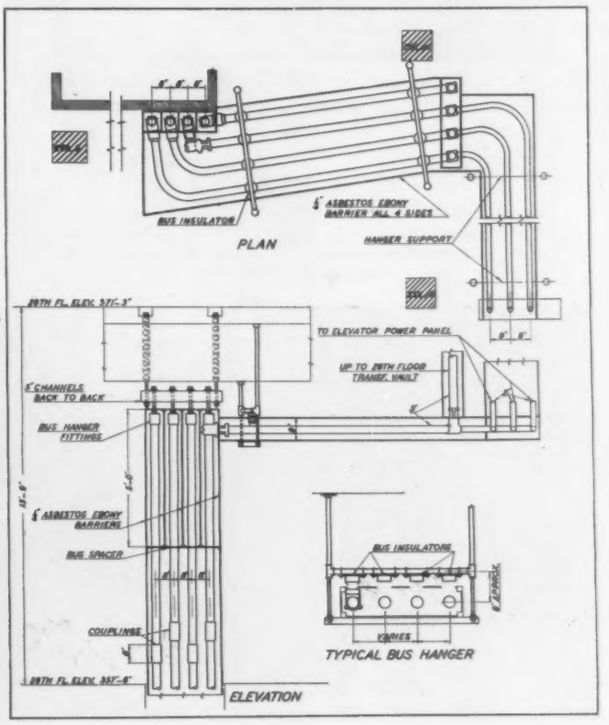


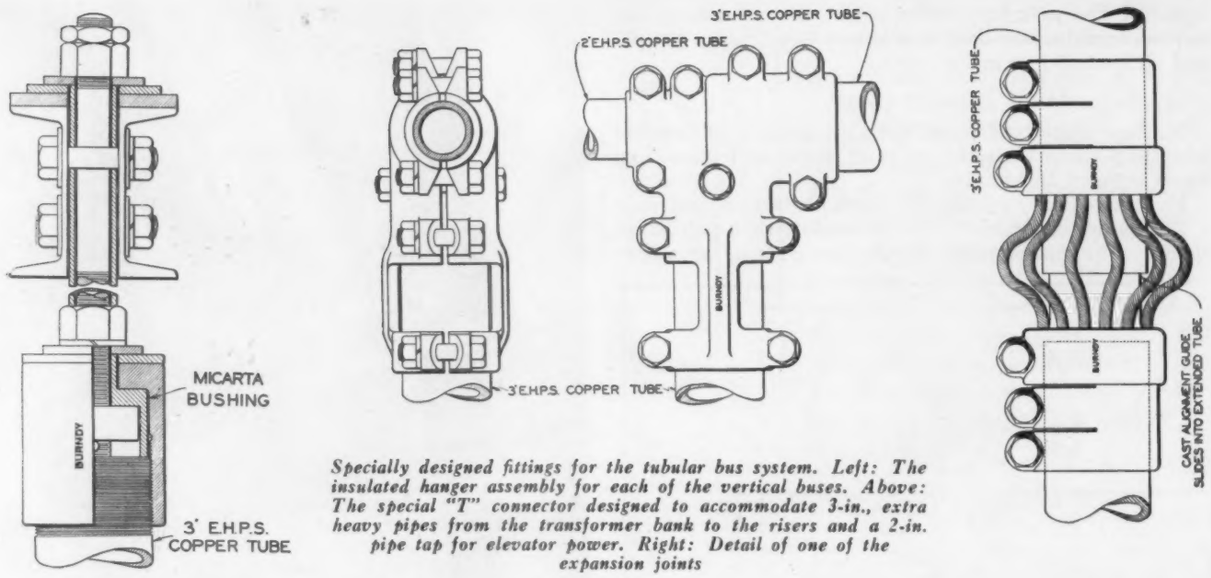


Above: *A close-up of the secondary bus hanger assembly and connectors to the horizontal run on the 28th floor. The bus hangers are supported by the structure at (B). At (T) one of the "T" connectors is seen. The can enclosing the loop of the primary cable is shown at (P)*

Left: *Drawing showing detail of fitting supporting primary cable by means of its anchor wires. In actual installation the anchor wires were extended above the fitting, served, doubled back and served again. Also the hanger fitting rested on the conduit cap without the nipple shown in the drawing*

Below: *Details of the secondary bus system arrangement on the 28th floor, connecting the transformer bank to the vertical riser buses, and providing a tap for elevator power*





Specially designed fittings for the tubular bus system. Left: The insulated hanger assembly for each of the vertical buses. Above: The special "T" connector designed to accommodate 3-in., extra heavy pipes from the transformer bank to the risers and a 2-in. pipe tap for elevator power. Right: Detail of one of the expansion joints

points the primary cable was to be supported by means of split-type wedge clamps inserted into the conduit at each pull box. This method, while less costly to install, was abandoned because there was a possibility of rupturing the insulation of the cable at each clamp, especially in view of the fact that the ultimate working pressure on the cable would be 11,000 volts.

2. The other method, which was adopted, consisting of the installation of a continuous length of specially built four-conductor 2/0, 19-strand, tinned copper cable with a 9/32-in. Okolite insulation around each conductor with a 0.005-in. tinned copper tape, cabled with jute, D. W. tape and one layer of saturated jute, and armored with No. 10 B.W.G. galvanized armor wire. The over-all diameter of the cable is 3.03 in., weight is 10.9 lb. per foot, and it is insulated for 15,000 volts. The armor is placed only on that portion of the cable which is suspended in the riser.

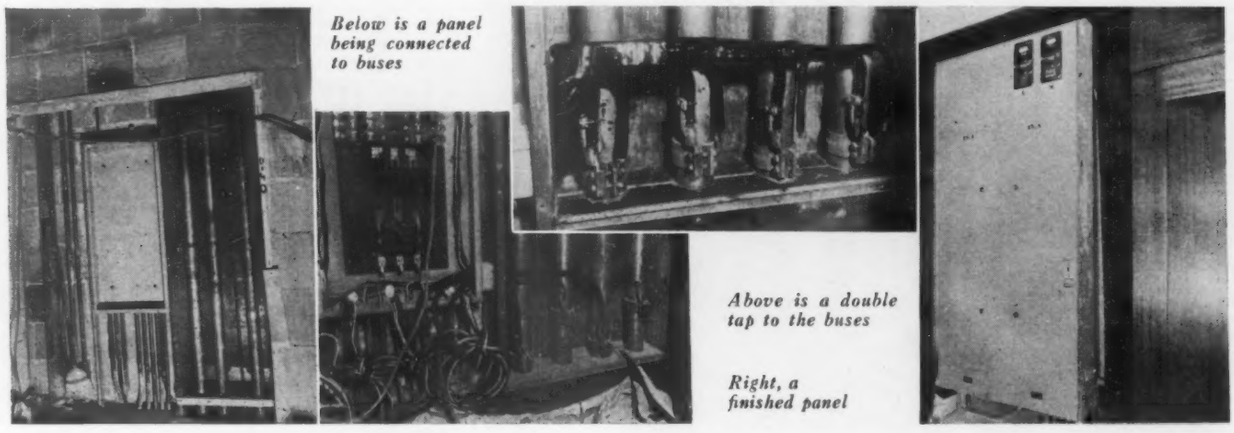
This cable was shipped on one reel and hoisted to the roof of the building. A special disk-type clamp was designed consisting of three plates bolted together. This clamp was placed on the conduit at the top of the riser. The cable was then fed down through the clamp. When the top end of the armor was in position the cable was made fast with a double set of chain blocks. Each of the armor wires was then looped around the center plate of the disk clamp and back onto the cable, served and turned back on itself and served again. The clamp was then tightened and dropped into place on the conduit.

This clamp is the only support on the cable throughout the vertical distance of 380 ft. and in no way does it endanger the insulation. The upper and lower ends of the cable, being unarmored, were then fed through conduits. The turns at the top and bottom of the shaft were enclosed in L-shaped pull cans, installed after the cable was in place. The cable was terminated in disconnecting-type potheads at both ends, from which points the power company completed the connections.

Secondary Bus System

The secondary tie between the network protector in the transformer vault on the 29th floor and the network protector in the sub-basement at the bulkhead was made by means of four 3-in., extra heavy, iron pipe size, hard drawn copper tubes placed on 8-in. centers. These tubes are of 98 per cent conductivity, and have a carrying capacity of 3,040 amp. based on an assumed current density of 1,000 amp. per square inch of cross-section. The tube weighs 11.82 lb. per linear foot.

Typical distribution assembly for each floor. Below: The riser shaft cabinet, with primary pipe at extreme right, distribution panel can at center, and buses in asbestos shaft at right



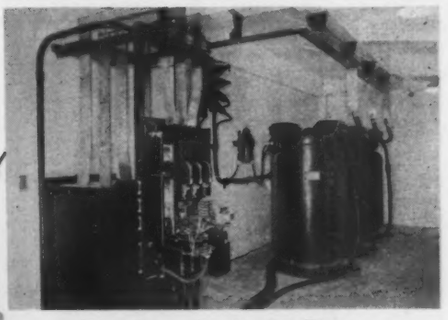
Below is a panel being connected to buses

Above is a double tap to the buses

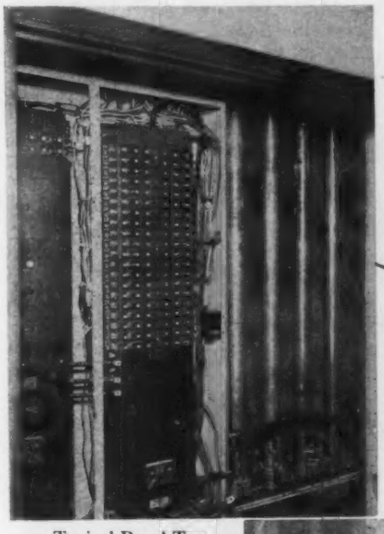
Right, a finished panel

Secondary Bus Hanger

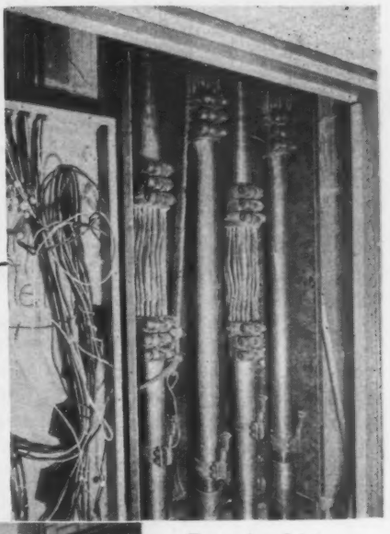
Primary Cable Hanger



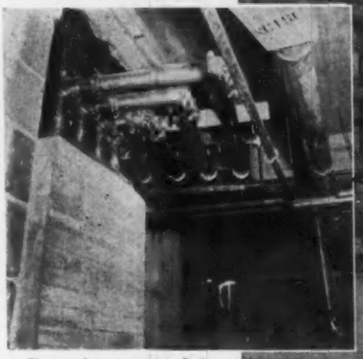
Transformer Vault—29th Floor



Typical Panel Tap

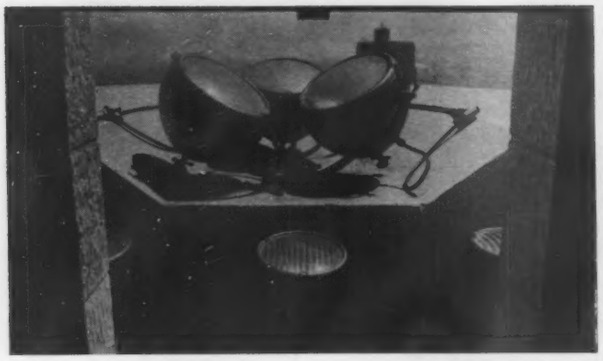


Expansion Joints
14th Floor



Base of Secondary Buses

Basement Power Panel



On top of each floral decorative detail at the 28th floor are mounted three floodlights to spot the shell above. A row of floodlights with spread lenses along the window ledge lights the tower portion

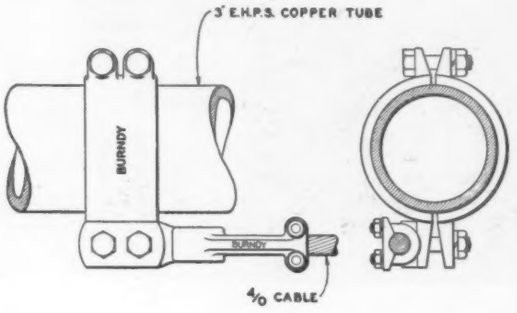
Half of each riser, or 190 ft., is suspended from the top of the shaft and the lower half is supported from the base, with an expansion joint in the center. Tubes were ordered in 20-ft. lengths, both ends being threaded with parallel machine threads. Theaded cast copper couplings, 8 in. long, were used in making up the joints.

A new and special bus hanger was designed to suspend each tube at the top. This hanger consists of a threaded Everdur cap in which is inserted a specially designed molded Micarta insulating bushing through which is placed a 1-in. cold rolled steel hanger bolt with both ends threaded. A nut is placed on the bolt inside the cap and locked in place with a cotter pin. A locknut is placed on the bolt at the top of the cap and insulated from the cap with a ⅜-in. Micarta washer. This bolt is continued to the top of a channel iron bus support which consists of two 5-in. channels placed back to back and suspended from the slab above by means of two 1¼-in. cold rolled steel bolts. The bolt of each bus hanger is supported on the top of the channel irons by means of a 5 x 5 x ⅜-in. cold rolled steel bearing plate, and a 3-in. round steel washer and locknut. A 3 x ⅜-in. Micarta washer is placed between the bearing plate and steel washer. A Micarta tube surrounds each hanger bolt.

A concrete pier was installed at the base of the riser with anchor bolts set in the top of the pier. A 1-in. steel bearing plate was then placed on top, leveled and grouted into place with a 1/16-in. Micarta sheet placed on top of the bearing plate. Over this Micarta sheet was placed a second 1-in. steel plate drilled (by templet) for the anchor bolts and base supporting caps. Micarta bushings were then placed for the supporting caps and the steel caps set in the bushings.

After the top and bottom assemblies were in place the buses were installed, being built both up and down to the expansion joint in the center of the riser.

Detail of connector by which taps are made from buses to panels



The entire secondary bus riser is enclosed in a ¼-in. ebony asbestos housing throughout its entire length. The face plate throughout the vertical riser is removable from the front to permit accessibility to the buses.

Asbestos ebony spacer plates are provided on the interior of the vertical housing on approximately 6-ft. centers. These plates consist of two sections, each section being one-half the depth of the housing. Each section has four half-circles cut from it of the same diameter as the copper bus. These spacer plates keep the bus in line and also prevent any side play. There is no insulation on the bus between phases except at the expansion joints, which are staggered. At these points Micarta tubes are placed over the bus opposite each expansion joint. The entire bus structure together with its housing occupies a space in the riser shaft of 33¾ x 8⅝ in.

The horizontal runouts in the sub-basement and on the 28th floor are supported by means of indoor-type bus supports. All bus fittings were made by Burndy.

Panel Boards

Panel boards are placed in this riser shaft adjacent to the bus housing. All panels are provided with four-wire three-phase buses, a panel main and single or double pole branch circuit switches as required. Branch circuit switches are Westinghouse type N.A.B. no-fuse circuit

Modern equipment includes an ozone producing machine, at left, and a battery of 20 electric refrigerator units at the rear which cool the drinking water for the building

breakers which eliminate all fuses from distribution panels.

At points throughout the building where three-phase power was required, Westinghouse three-pole brush contact switches were installed and made part of the panels. At some points on various floors it was necessary to supply heavy loads remote from the riser shaft. At such points sub-distribution centers were established and sub-feeders carried back to the panels. Brush contact switches were placed on the panels controlling the sub-feeder. For floodlight control sectional panels were provided. Ahead of each section Diamond H contactors were installed with momentary contact switches to operate them from the sub-basement switchboard.

Underfloor Duct System

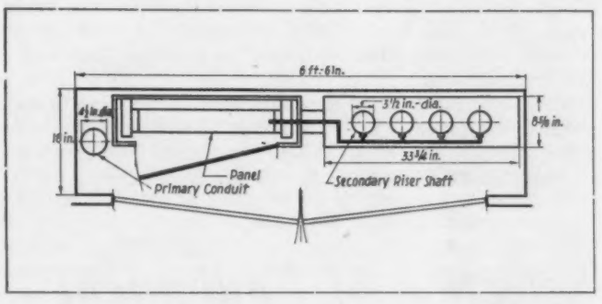
Telephone distribution was cared for throughout the building by means of two-channel Nepco underfloor duct. Two rows were placed around all exterior walls. The first line is approximately 3 ft. 8 in. in from the exterior wall and the second line 10 ft. 6 in. distant from the first line. With this spacing it is possible to reach

a 5-ft. desk at any point on the floors. The two-channel system was adopted to serve telephone and signal wiring and power wiring.

Floodlighting

The building is floodlighted on all four sides, the south and east face from the fourth floor level to the roof, and the north and west face from the eleventh floor to the roof. Two exterior banks of floodlights are located on buildings opposite the south and east faces with 28 kw. in each bank. The north and west faces are lighted by means of two banks placed on the roof of the Shell Building with 28 kw. in each bank.

On the building proper at the 21st, 23d, and 28th floors floodlights are placed in recesses or behind ledges. At the 21st floor level there is a total of 18 kw., at the 23d floor a total of 62 kw. and at the 28th floor 40 kw., the total connected floodlighting load being 232 kw. All controls for the various levels as well as the two exterior banks are located on the switchboard in the sub-basement.

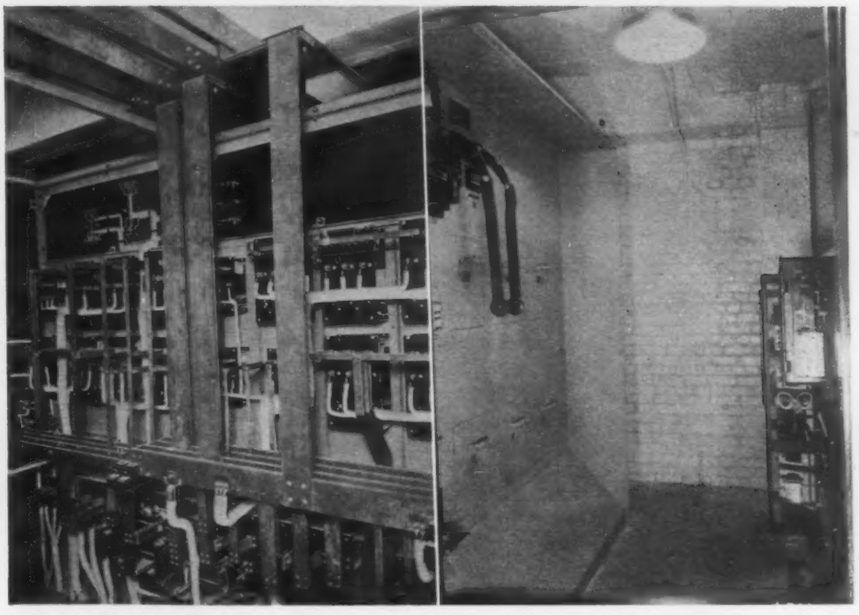


How small a space is occupied for the primary and secondary distribution system riser shaft is shown by the plan above

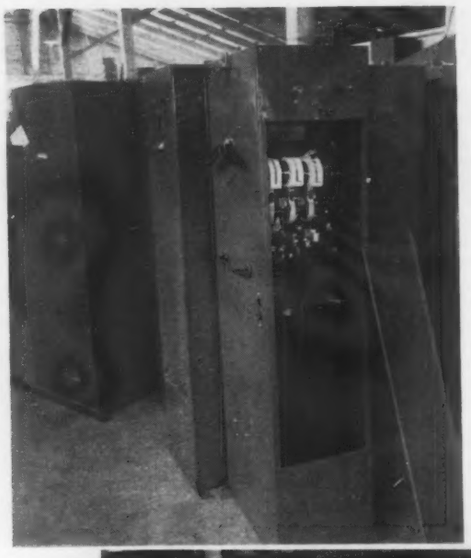
Unique Features Include:

1. First application in the West of the low voltage, a.c. network system to a commercial building.
2. First extensive use of bare bus distribution system, particularly of copper pipe bus.
3. Adequacy provisions for three watts per square foot.
4. No circuit wire less than No. 12 B.&S.
5. Voltage drop less than 3 per cent on any circuit.
6. Guth indirect 300-watt lighting units, spaced on 10-ft. centers, or four to the ordinary office room.
7. Convenience outlets at 4-ft. intervals along walls and available at 2-ft. intervals along underfloor duct system.
8. Two-channel underfloor duct system for telephone, signal and convenience outlet circuits.
9. Bank of 20 G.E. refrigerator units provides flexible water cooling system for the entire building.
10. An ozonator for air conditioning, besides an entire ventilating system.
11. Latest type, self-leveling, fully-automatic Otis elevators.
12. An all-electric kitchen for the employees' lunch room.
13. Amber floodlighting of entire building, giving it distinctiveness.
14. No main switchboard. No mass of feeder conduits from basement to each floor. No spare conduit risers needed for future additions to load, as new loads may be tapped to the buses at the floor where they are required. No large riser shaft. No pull cans at each floor with elaborate anchoring of feeder cables. No block from which to make tap for the 300 to 400 amp. required on each floor.
15. Though this new system had to be pioneered by the electrical contractor, devising methods as the work progressed, the installation went forward without a single serious delay.
16. The electrical work began on Oct. 7, 1929; the building was turned over to its owners April 20, 1930, a record time of 6 months, 13 days.
17. The soundness of the system convinced the Southern California Edison Company engineers, and the new Edison Building in Los Angeles will employ similar distribution methods, although not using the a.c. network system.

There is no main switchboard in the Shell Building. For all practical purposes the network protectors, the oil circuit breakers, and the oil fused cut-outs take the place of the main board. The two boards shown here are each power panels feeding from the secondary bus system. That on the left is the basement power panel which controls building floodlighting, ventilating and heating equipment, pumps, and other basement power. It taps directly from the flat buses coming through the wall to its rear from the network protector and street transformer vault. The buses, at the top, then go on into the asbestos shaft as shown in the illustration at the right-hand lower corner on page 85 Right: The elevator power panel on the 29th floor, fed by means of the 2-in. copper tube taps on the 28th floor, as already illustrated. At the extreme right are the power company metering instruments. (For description of the a.c. network system and metering in the Shell Building, see Electrical West, *May 15, 1930, pp. 461-8)*



Industrial



"Standard Packages" Applied to Motor Installation

MASS production standardized methods as applied to pumping plant electrical installations have given the Mongerson Electric Company, of Bakersfield, a large following and a wide distribution.

The standardized control and service unit by which a motor installation on a pumping plant may be served is made up to consist of a standard metal can containing the switch and control apparatus and standard sizes of service pipe and flexible conduit feeders. It is made up in several sizes to accommodate various sizes of motor pump equipment. (See illustrations above.)

The standard equipment consists of a service head, and 10 ft. of conduit of the pipe and wire size determined by the horsepower loading. The wire is pulled in the service pipe and lugs are soldered on for connection to the switch can. A length of flexible steel conduit is provided for the run from the switch can to the motor itself. Wires are also pulled in this and lugs soldered to the ends of the wire ready for hooking up. A ground rod, clamps, and all fittings necessary to complete the installation are provided in the arrangement. The service pipe and the flexible conduit are shipped in a long crate together with the control panel can.

The control cans are made of heavy sheet-iron stock, spot welded together. They are fabricated in various sizes to accommodate motors from ½ hp. to 200 hp. in size. The can contains either an externally operated switch or push button and contactor equipment as required. Space and mountings are provided, with the leads in place, for the current transformer which the power company mounts on the inside. Special adjustable clamps are provided, mounted by means of insulated bushings, on which the power company can mount its meter on the outside of the can. Two sockets are provided on top of the can for lamps or for convenience outlet circuits. These may provide light in the pump house or be used for portable cord tools. A push button control for the contactor inside is provided on larger size installations.

Mr. Mongerson finds a ready market for this standardized equipment. He can sell it at a very reasonable price, because of the quantity production manufacture, through the pump manufacturers and dealers.

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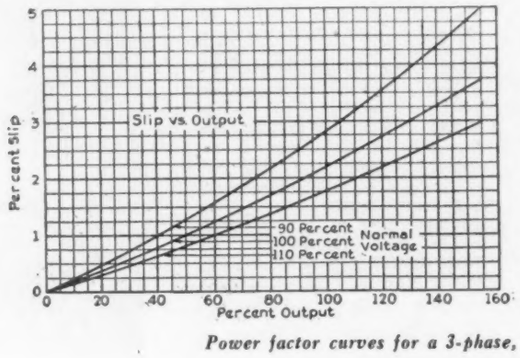
Selection of Equipment Improves Power Factor

Another Practical Slant on Power Factor in Motor Installation

By Otto Weimer
Electrical Engineer, Los Angeles

IN A PREVIOUS article on power factor, consideration was given to the cause of low power factor and the resulting disadvantage to the operation of an industrial plant. The next step is to make a careful study of the available means of improving this condition, and then to select and apply those methods which will give the best possible results consistent with the over-all economy for the particular plant under consideration.



Power factor curves for a 3-phase,

In almost any existing plant the most common cause of low power factor conditions will be found to be the operation of some of the motors at much less than their rated capacity. This is called over-motoring. It may be due to the mistake of providing too liberal a margin of safety against "burn-outs" from occasional overloads, or it may be due to the necessity of requiring a much larger motor to start a load than is necessary to keep it running. Bearing in mind that there is very little decrease in the power factor of an induction motor from full load down to about three-quarter load, it is often possible to improve the power factor by operating it as close to its rated load as the conditions will permit.

In the case of an over-motored condition where it is necessary to secure heavy starting duty, the best solution is to replace the motor with one that is designed for this kind of service. This may require a high torque induction motor, or it is sometimes possible to increase the starting torque of a standard squirrel cage motor by turning down the end rings on the rotor. This should only be done by an experienced man, and it should be remembered that the resulting improvement in starting torque will result in poorer speed regulation with varying loads. Also, the efficiency will be slightly reduced.

When the load to be started requires considerable time to attain normal speed, because of its inertia, a slip ring type induction motor with a resistance controller will offer a still better solution. This is on account of the fact that the slip ring motor, with a properly designed controller, will develop its maximum torque at starting and can be brought up to speed in steps so that the starting current can be held down to the minimum amount required by the load, while at the same time the motor can be selected to operate at its point of highest power factor.

If a condition exists where it is desirable to retain the advantages of the squirrel cage motor for the application in which it is used, one of the most efficient means of improving power factor is by the use of static condensers called "capacitors." To offset the disadvantage of the additional expense involved, this method offers the fewest complications in making the change and makes it posible to correct the power factor for the individual motor, or for groups of motors, according to the requirements of the case. The amount of correction depends on the number of capacitor units and the only limitation is the matter of cost.

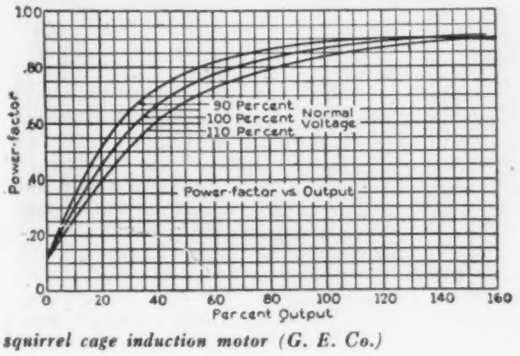
The same results of condenser action for improving power factor can be obtained by the use of synchronous apparatus, such as synchronous condensers, synchronous motors, synchronous converters, and so-called unity power factor motors. The synchronous condenser is simply an a.c. generator floating on the line and over-excited to produce a leading current. When it is also used to carry a mechanical load it is called a synchronous motor. The synchronous converter can also be used to supply leading current by over-exciting but its use is limited to cases where direct current is required.

The unity power factor motor is a special type of converter with an additional squirrel cage winding for starting and overload. The over-excitation is adjusted to give the desired power factor. It is advisable to consult the manufacturers to determine which type is best suited for the particular application in question.

By way of caution, it may be said that too much importance must not be given to the power factor problem, as there are often more important considerations from the point of view of the industrial plant owner. Like all engineering problems, it is a matter of making the best compromise possible. The benefits obtained, such as lower power bills, smaller investments, and improved operating conditions must be balanced against the increased cost of equipment necessary to improve the power factor. This is where intelligent salesmanship as well as technical knowledge may be profitably applied.

All that has been said assumes that it is known that a condition of poor power factor exists, and that there is some incentive or necessity for improving it. Perhaps the power company offers a special rate inducement for high power factor loads, or an expansion is contemplated. In case of either of these events happening a decision must be made as to whether it is more economical to improve power factor than to re-wire the plant for larger capacity.

Whatever the cause, it is always necessary first to ascertain whether or not the power factor condition actually exists. This can only be determined positively by the proper measuring instruments. The various ways of making such a survey by metering, and the calculations necessary from the test data, will be covered in a future article.



squirrel cage induction motor (G. E. Co.)

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Flexible Shaft Equipment Sells

Some motor dealers, by specializing in such appliances, have built up fairly good side lines in spray outfits and small motors for numerous hand operations. The small motor equipped with a flexible shaft finds a number of uses besides that of the dentist's machine, familiar to everyone. Dentists' tools and equipment can also be used in the making of models and the drilling of small holes, and for a variety of intricate work.

News

Portland Prepares for Role of Host to A.I.E.E. September Convention

FIVE technical sessions are included in the business program that has been prepared for the annual Pacific Coast convention of the American Institute of Electrical Engineers to be held in Portland Sept. 2-5. Two sessions will be devoted to transmission, one to power stations, one to communication, and one to general research and development. The students will be heard from during two sessions, while one evening will be given over to a conference on student activities by the Counselors' Committee from Districts 8 and 9.

The program follows:

Tuesday, Sept. 2

9:00 a.m.—Registration at convention headquarters, Multnomah Hotel.

10:00 a.m.—Opening of the convention.

10:30 a.m.—Technical Session on Transmission.

"Value of Wood Applied to Steel Structures," by O. A. Austin, Ohio Insulator Company, Barberton, Ohio.

"Critique of Ground Wire Theory," by L. V. Bewley, General Electric Company, Schenectady, N. Y.

"Influence of Polarity on High Voltage Discharges," by F. O. McMillan and E. C. Starr, Oregon State College, Corvallis, Ore.

2:00 p.m.—Technical Session on Transmission.

"Calculation of Performance of Oil Circuit Breakers," by A. C. Schwager, Pacific Electric Manufacturing Company, San Francisco.

"Corona Tests at Stanford," by J. S. Carroll, Stanford University, Palo Alto, Calif.

"Studies in Strengths of Present Day Insulators," by K. A. Hawley, Locke Insulator Corporation, Baltimore, Md.

Wednesday, Sept. 3

9:00 a.m.—Technical Session on Power Stations.

"Steam Power Development of Pacific Gas and Electric Company," by R. C. Powell, Pacific Gas and Electric Company, San Francisco.

"Grounding Banks of Transformers With Neutral Impedances and Resultant Transient Conditions in Windings," by J. K. Hodnette and F. J. Vogel, Westinghouse Electric & Manufacturing Company, Sharon, Pa.

"Relay Developments on Southern California Edison Company System," by E. R. Stauffacher, Southern California Edison Company, Ltd., Los Angeles.

"Mercury Arc Rectifiers," by O. K. Marti, American Brown Boveri Company, Camden, N. J.

2:00 p.m.—Technical Session on Communication.

"Commercial Aircraft Radio Phone Communication," by R. H. Freeman, Boeing Air Transport Incorporated, Seattle.

"Harmonic Generation by means of Grid Circuit Distortion," by F. E. Terman, Stanford University, Palo Alto, Calif.

"Power Station Communication Systems," by R. B. Ashbrook and F. B. Doolittle, Southern California Edison Company, Ltd., Los Angeles.

8:00 p.m.—Conference on Student Activities by Counselors' Committee, Districts Nos. 8 and 9.

Thursday, Sept. 4

9:00 a.m.—First Student Session.

Afternoon—Recreation and golf tournament.

Evening—Informal banquet.

Friday, Sept. 5

9:00 a.m.—Technical Session on Research and Development.

"Pennsylvania Electrification," by J. V. B. Duer, Pennsylvania Railroad, Philadelphia.

"Electric China Firing Kiln," by George S. Smith, University of Washington, Seattle.

"Forecasting Precipitation," by A. F. Gorton, Scripps Institute of Oceanography, La Jolla, Calif.

"Electricity's Part in Copper Production," by R. J. Corfield, Utah Copper Company, Salt Lake City.

2:00 p.m.—Second Student Session.

Subcommittee Chairmen

The following subcommittee chairmen are in charge of convention activities:

Program—Harold H. Cake.
Golf—R. J. Cobban.
Eentertainment—C. W. Fick.
Finance—A. S. Moody.
Hotel—A. K. Morehouse.
Transportation—C. P. Osborne.
Local Trips—E. F. Pearson.
Publicity—Berkeley Snow.
Registration—A. H. Kreul.
Reception—J. E. Yates.
Ladies' Entertainment—Mrs. A. S. Moody.

Saturday, Sept. 6

Morning—Inspection trips:

Ariel Development of Northwestern Electric Company on Lewis River (six hours).

Oak Grove Development of Pacific Northwest Public Service Company on Clackamas River (all day).

Camas Paper Mill of Crown-Willamette Paper Company, Camas, Wash. (five or six hours).

The three inspection trips scheduled for Saturday, Sept. 6, have been chosen for their diverse appeal. Any one of these trips will occupy the greater part of a day; luncheon will be served on each, and round trip transportation by automobile provided without expense to rigistered delegates and guests, including visiting ladies.

Entertainment

Principal entertainment features of the convention will be an informal reception and dance at the Multnomah Hotel, Tuesday evening, Sept. 2. Thursday evening, following the golf tournament, an informal banquet will be served at the Portland Golf Club at which district paper prizes will be presented as well as golf prizes and prizes for the ladies' putting contest. Dancing and other entertainment features will be included at this event.

The ladies are invited to all events and, in addition, special events are being provided for them each afternoon by the ladies' entertainment committee. These include a drive through Portland's beautiful residential districts followed by a tea at the White Owl Tea Room on Council Crest, a luncheon at the Waverly Country Club followed by a visit to the Lloyd Frank gardens on Palatine Hill, a bridge tea and putting contest at the Multnomah Golf Club, and a motor trip on the famous Columbia River Highway. The committee will also assist the visitors in arranging trips to any other places in and around Portland.

The annual convention golf tournament will be played on the Portland Golf Club course on Thursday afternoon, Sept. 4. The John B. Fisken cup will again be in competition open only to members of the Pacific Coast Sections. Eighteen-hole, medal play at a handicap will determine the winner. In addition to this trophy, however, a number of prizes will be offered for a variety of events and will be open to any registered member or guest.

Transportation

Summer round-trip rates of one and a third fares have been extended to delegates from California by the Southern Pacific Railroad. To delegates entering Portland via the Northwest a group rate is offered by the Great Northern, Northern Pacific, Spokane, Portland & Seattle, and Union Pacific, which provides that any party of ten or more traveling together on the going trip, returning together or individually as desired, but using the same route in both directions, will be granted a special rate of one and one-third fares for the round trip. Portland is served by the Boeing System, the West Coast Air Transport Company, and the Varney Air Lines.

Transportation to and from all the regularly scheduled events will be supplied by the local committee and in addition special trips around Portland may be arranged with the committee by those delegates desiring such service.

Hotel Accommodations

Convention headquarters will be maintained at the Multnomah Hotel where delegates may engage reservations at prices ranging from $2 to $6 for single rooms; $3 to $8 for double rooms, or $10 to $12 for suites.

Other hotels agreeing to reserve rooms for delegates are the Benson, Heathman, New Heathman, and the Portland Hotel, all of which have rooms within the same general price range as that quoted by the Multnomah. Reservations should be made direct with the hotel in advance.

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Priest Rapids License Rejected—As the Washington Irrigation and Development Company was unable to establish prior to July 1 that it would be able to find a market for enough power to justify the installation of 200,000 hp. at Priest Rapids on the Columbia River, the Federal Power Commission has rejected the application of the company for another license.

Officers in Re-organized Great Western Co. Named

Corporate re-organization of the properties of the Great Western Power Company of California, recently acquired by the Pacific Gas and Electric Company, was completed at a meeting of the Great Western company held early last month.

The following officers were elected: President—A. F. Hockenbeamer; vice-president and general manager—P. M. Downing; vice-president and assistant general manager—A. Emory Wishon; secretary-treasurer—D. H. Foote; and comptroller—E. W. Hodges.

The following directors also were elected: Frank B. Anderson, Charles L. Barrett, Allen L. Chickering, John P. Coghlan, P. M. Downing, F. T. Elsey, Guy C. Earl, D. H. Foote, A. F. Hockenbeamer, C. O. G. Miller, T. J. Straub, A. Emory Wishon and A. G. Wishon. The entire board now consists of California residents.

The same officers were elected for the various subsidiaries of the Great Western Power Company of California, namely, Great Western Power Company, California Electric Generating Company, City Electric Company, Napa Valley Electric Company and Feather River Power Company.

Officers of the San Joaquin Light & Power Corporation elected in the re-organization were announced in ELECTRICAL WEST of July 1, p. 41.

No Radical Changes in San Joaquin Corporation

Setting at rest widely circulated rumors in connection with the re-organization of the San Joaquin corporation, A. Emory Wishon, who in addition to being made president of the San Joaquin company, is vice-president and assistant general manager of Pacific Gas, has announced that no radical changes either in personnel or methods of operation are to be made.

"Alliance of the San Joaquin company with Pacific Gas and Electric Company, which has acquired control through an exchange of stock with the North American Company, means, of course, that there will be adjustments looking toward improved efficiency and co-ordination of service and development," he said.

"In these adjustments, which will take into consideration all possible economies of operation, there may be some reduction of man-power, but it will not be material.

"The San Joaquin company is efficiently officered by men who have been with the company for many years and whose value lies largely in their familiarty with the territory and acquaintance with its people. As to the rank and file of the organization, they are just as essential today in the operation of the company as they were yesterday.

"There is no intention to move the San Joaquin company's offices from Fresno or to abandon our building there. To the contrary, the gas department of the Pacific Gas and Electric Company is soon to be moved to the power company's building so that there may be co-ordinated management and accounting, as well as greater convenience to the public. More of the building's floor space will be devoted to company work than ever before.

"Under the new set-up I will be able to give more of my time to San Joaquin company affairs than I have since I was transferred to San Francisco three years ago."

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Puget Sound Co. Reduces 8-Cent Energy Rate

Reductions in rates for domestic and commercial energy to benefit the entire western and central Washington territory served by the Puget Sound Power & Light Company, have been announced by A. W. Leonard, president of the company. A reduction of ½ cent per kw.-hr. will apply in all territory where the present top step is 8 cents per kw.-hr. The new rate will be effective for current consumed after Aug. 1, and is to be followed March 1 of next year by a further reduction ranging from ½ cent to 1 cent per kw.-hr. President Leonard announces that the rate cut is the forerunner of a series to be made, with the result that the highest rate will not exceed 5.5 cents in 1932. The present reduction is not effective in Seattle, Tacoma, or other large cities on the west side, where the present rates generally are below the 8-cent maximum.

Plant expansion, with more economical production of electrical energy, makes the rate reduction program possible, according to Mr. Leonard.

"We have added a second unit to the Shuffleton steam plant at Renton," Mr. Leonard states, "giving us more than 50,000 hp. additional capacity. The Rock Island plant on the Columbia River will add 240,000 hp., and these and other extensions will provide a capacity and low operating cost which will make the 5.5-cent rate applicable generally throughout our territory probably within two years."

The territory affected by the immediate lower rate includes Vashon and Bainbridge Islands, Olympic Peninsula, southwestern Washington, and Cle Elum.

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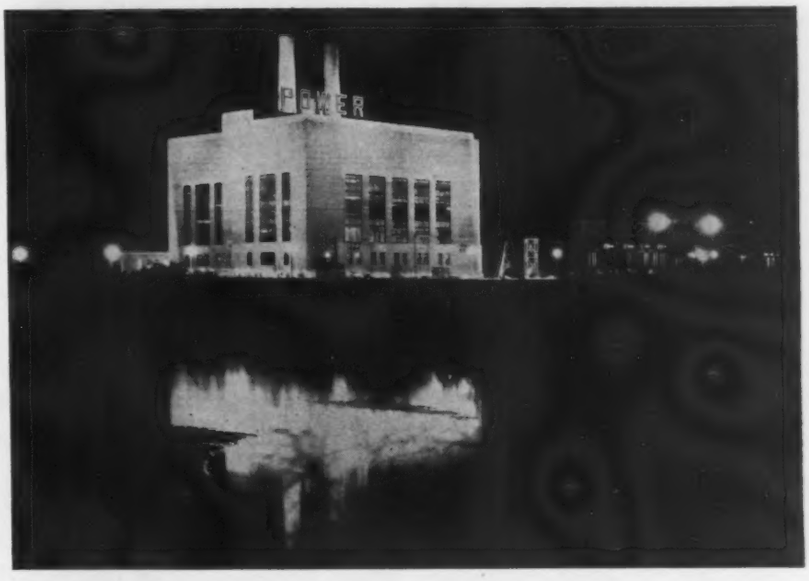
Power Station at Night a City Attraction

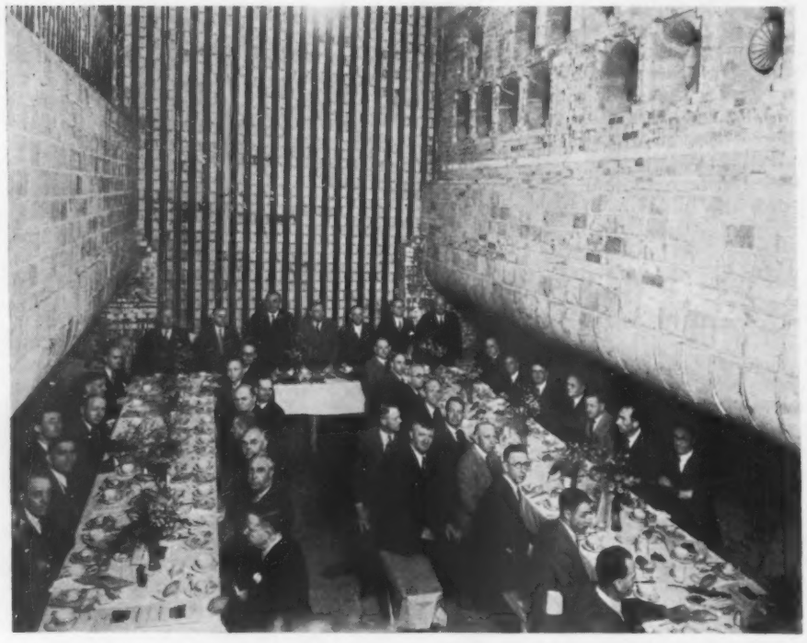


FLOODLIGHTING of the Rio Grande power station and grounds, recently completed by the El Paso Electric Company, El Paso, Texas, has made the station one of the show places of the city. Twenty-one 1,000-watt floodlights with stippled lenses, segregated in five banks and mounted on concrete bases at the ground level, illuminate the front and side of the main plant building. Six 500-watt floodlights, also with stippled lenses, have been mounted on the plant roof and are used to illuminate the two stacks. Ground lighting is provided along a circular driveway by twelve 300-watt incandescents mounted on hollow-spun concrete posts and equipped with reflectors.

A spectacular feature of the installation is the large sign, "Power," on the top of the building in double-tube 12-ft. red letters.

The combined installation has a demand of approximately 31 kw. and is in operation every night from dusk until 11 o'clock. The illuminating engineering department of the El Paso company drew up the specifications for the equipment, and it was installed by Stone & Webster, Inc.

Boiler Interior Serves as Banquet Hall



CELEBRATING the completion of the largest boiler in the Northwest, the Pacific Northwest Public Service Company held a banquet recently inside the boiler for the mayor, city commissioners, representatives of various firms contributing to the installation, contractors and company officials. This boiler, which is a Babcock & Wilcox Sterling of 2,650 hp. capacity, is located in the company's station "L" steam plant and was installed primarily to serve a 35,000-kw. turbo-generator now in process of erection.

The boiler is equipped to burn either hogged fuel or oil and will deliver steam at 450 lb. pressure and 700 deg. F. It will evaporate 310,000 lb. of water per hour at 400 per cent rating, or sufficient to generate 30,000 kw.-hr.

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Public Service Company Rate Cut Ordered by Oregon Commission

REDUCTIONS of from 2 to 22 per cent in rates for residential service and for commercial lighting among the customers served by the Pacific Northwest Public Service Company, Portland, have been ordered by the Public Service Commission of Oregon as a result of the valuation proceedings before that body during the past two years. In these proceedings the commission was acting on its own motion and on a petition from the City of Portland entered in April, 1928, and the first hearings were had in June of that year. Following extensive investigations by commission engineers and representatives of the city, the principal hearings occurred in December, 1929, and were concluded in January, 1930.

In its recent order the commission set the value of the light and power property of the company at $45,460,000. This amount was arrived at largely by bringing the 1916 valuation up to date and is about $3,000,000 less than the company figure showed. Difference between the commission and the company valuation is found principally in the correction of minor errors and in the exclusion from the present value of some $2,000,000 in the cost of the Oak Grove development on the ground "that this investment is installed to meet future requirements and is not now used nor useful in the public service." The further exclusion of another $2,000,000 from the value of the company's station "B" at Oregon City is ordered by the commission on the ground that the value has been transferred to non-utility use.

In general the rates grant the greatest saving to the smaller user, both in the case of residential service and commercial lighting service. The new rate for residential service has a top step of 5.5 cents per kw.-hr. as against a 7-cent top step in the old rate; the lowest step in the new rate is 1.8 cents as against 2 cents in the old rate. The new rate abolishes the former 5 per cent prompt payment discount. Comparison of the new and old residence rates for various sized customers using varying amounts of service is shown in the accompanying table.

COMPARISON OF NEW AND OLD RESIDENTIAL RATES, PORTLAND

	Connected Lighting Load Watts	Monthly Use Kw.-Hr.	Present	Proposed
Lighting	600	20	$1.42	$1.10
	"	25	1.56	1.37
	"	30	1.70	1.65
	"	35	1.84	1.80
	"	40	1.99	1.95
	"	45	2.13	2.10
	"	50	2.27	2.25
Lighting and range	"	100	3.41	3.39
	"	150	4.36	4.29
	"	200	5.31	5.19
	"	250	6.26	6.09
Lighting	800	20	1.42	1.10
	"	30	1.97	1.65
	"	40	2.25	2.15
	"	50	2.54	2.45
Lighting and range	"	100	3.72	3.69
	"	150	4.62	4.59
	"	200	5.52	5.49
	"	250	6.42	6.39

In the commercial lighting and heating schedule, which also has a top step of 5.5 cents per kw.-hr. and gets down to 1 cent under certain kinds of use, the reduction is uniform for all customers having the same sized load irrespective of the number of hours of use. This in effect favors the small user, providing for him a higher percentage of reduction than the large user. Estimate of the saving to customers in these two schedules is about $228,000.

A third and entirely new rate for farm service is likewise provided in the commission order. This rate calls for $1.50 per month fixed charge, and an energy charge of 3 cents per kw.-hr. for the first 400 kw.-hr., and 2 cents per kw.-hr. for all energy used over 400 kw.-hr. per month, with a monthly minimum charge of $3. This rate is optional with the customer and is designed to cover the farmer making a widely diversified use of different classes of service.

The order makes the new rates effective Aug. 15, and the company has taken steps to file tariffs in accordance with the order. While the order affects only the customers of the Pacific Northwest Public Service Company, the competing Northwestern Electric Company has met the reduction and filed identical rates to take effect on the same day.

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HAYCOCK LANDS ON POLE TOP, CREATES FIRE—Linemen of the Pacific Northwest Public Service Company, Portland, are still wondering what possessed an ordinary haycock recently to leave its field 70 ft. away and come to rest on top of one of the utility's poles. The unusual behavior of the pile of hay was first discovered by nearby farm hands when they noticed the crossarms of the pole blazing high. Before linemen could reach the scene the fire had melted the high transmission line which supplies power to the City of Salem and service was interrupted and considerable other damage created by the meandering haycock.

Applications in Conflict With Boulder Dam Rejected as Construction Starts

Washington Correspondence

ACTIVE investigations preliminary to construction at Boulder Dam are being pushed by the Bureau of Reclamation now that the appropriation of $10,660,000 has been made available for this purpose. (ELECTRICAL WEST, July 1, p. 38.)

The Secretary of the Interior has advised the three contractors for Boulder Dam power—the Metropolitan Water District, the City of Los Angeles, and the Southern California Edison Company—of the commencement of contual problems. As ELECTRICAL WEST goes to press, Arizona's threats to enjoin the work have not yet materialized but still are being actively considered.

Applications on the Colorado River which have been rejected by the Federal Power Commission represent a total of 7,000,000 hp. Five applications were rejected outright because they are in conflict with Boulder Dam. Those applications, with the installed capacity of each and the location, are shown by the following:

No. 231	James B. Girand	130,000 hp.	Pierce's Ferry
No. 238	City of Los Angeles	800,000 hp.	Boulder Canyon
No. 258	Southern California Edison Co.	1,200,000 hp.	Black Canyon
No. 392	G. Henry Stetson	1,600,000 hp.	Boulder Canyon
No. 875	State Institutions of Arizona	340,000 hp.	Grand Wash

The remaining 21 applications were rejected subject to the right of appeal within 90 days. Those applications are as follows:

No. 30	Beckman & Linden Engineering Corp.	200,000 hp.	Parker
No. 59	E. L. Beyard	1,800,000 hp.	Lee's Ferry, Pigeon Spring, Diamond Creek, Spencer, Pollywog, Cliffs, Grand Wash, Virgin, and Boulder
No. 111	Southern California Edison Co.	3,300,000 hp.	Glen Canyon, Marble Canyon, Diamond Creek, Pierce's Ferry
No. 121	James B. Girand	200,000 hp.	Diamond Creek
No. 230	James B. Girand	130,000 hp.	Andrus Canyon
No. 265	Guy P. Mohler	400,000 hp.	Eldorado Canyon
No. 301	Clare N. Stannard	57,000 hp.	Kremmling
No. 391	G. Henry Stetson	168,000 hp.	Bulls Head
No. 647	City of Los Angeles	200,000 hp.	Parker
No. 660	Fred T. Colter	3,000,000 hp.	Glen, Redwall Bridge, Devil's Slide, Flour Sack, Pierce's Ferry, and Grand Wash
No. 661	State Institutions of Arizona	1,000,000 hp.	Bridge Canyon
No. 668	Southern California Edison Co.	180,000 hp.	Mojave Canyon
No. 770	State Institutions of Arizona	750,000 hp.	Glen Canyon
No. 808	State Institutions of Arizona	200,000 hp.	Parker
No. 158	Utah Power & Light Co.	100,000 hp.	Rattlesnake Canyon on Green River
No. 165	Utah Power & Light Co.	63,000 hp.	Flaming Gorge on Green River
No. 279	Utah Power & Light Co.	800,000 hp.	Swallow Canyon, Echo Park, Island Park, Split Mountain, Minnie Maud and Rock Creek on Green River, Juniper Mountain, Maybell, Lilly Park, and Blue Mountain on Yampa River
No. 524	Humphreys & Ratliff	120,000 hp.	Split Mountain Canyon
No. 767	Joseph Wittman	8,000 hp.	Williams River and tributaries
No. 924	State Institutions of Arizona	70,000 hp.	Tolchico and Grand Falls on Little Colorado and ultimate development of full head to Colorado River
No. 1003	United Verde Copper Company	82,000 hp.	Tolchico, Grand Falls, Coconino, Lower Falls and Black Falls on Little Colorado River

struction, thanking them for their "continuing co-operation" toward the success of "the most significant step yet taken by this country in the conquest of the desert."

Comparatively few men have been employed on the project as yet with the appropriation so recent. A skeleton force is maintained for survey and clerical services which will gradually be expanded with additional men on the job and at the Las Vegas (Nev.) office. Much work remains to be done in drawing specifications and solving contrac-

As to the first group, the commission has concluded that the energy production from the Boulder Canyon project will so adequately meet the probable power demand of the immediate region within the next ten years that there will be little chance for the early development of any competing projects in the same locality. In respect to the second group, the commission's engineering experts have determined that, owing to lack of rapidly increasing market demand in the upper basin and the additional time required for the negotiation of water allocations between the upper basin states, no agency will be in a position to proceed with construction in the limited period which might be allowed under permit and license.

It has been indicated at the commission's office that in case any of the applicants are able to present within a limited period a convincing showing that early construction of their proposed projects is desirable and necessary in the public interest, some modification of the cancellation order may be considered.

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Fresno, Calif., Seeks Gas Lands for Electric Needs

What is regarded as the first step toward the municipal ownership of gas and electric utilities in Fresno, Calif., was the recent opening of negotiations by the city with three large California oil companies for the purpose of obtaining options on gas lands sufficient to supply not only the gas needs of the community, but the electrical needs as well.

The decision to obtain proposals for options on gas property from which a sufficient quantity of natural gas may be obtained for the purposes named, was arrived at by the city commission following a meeting in Tulare, Calif., at which B. F. Delanty, general manager of the Pasadena Municipal Light & Power Department, told the city commissioners of the City of Pasadena's successful experience in using natural gas in the generation of electricity. He stated that in the past 23 years Pasadena has made large profits in the manufacture and sale of electricity, at the same sime has provided low rates and a satisfactory service to consumers, and has been able by this means to cut its tax rate down to one dollar a hundred.

On the day following the Tulare meeting C. C. Van Valkenburg, Jr., commissioner of public works, and Claude Rowe, city attorney, were instructed by the unanimous vote of the city commission to obtain the proposal for options on the gas properties.

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Equipment Ordered for Rock Island Project

Contracts for the supply of equipment for its Rock Island development, involving in excess of $800,000, have been awarded by the Washington Electric Company, a subsidiary of the Puget Sound Power & Light Company, as follows:

Four 15,000-kw. generators and sixteen 667-kva., 13,800-volt transformers to the General Electric Company.

Seven 10,000-kva., 13,800-115,000-volt outdoor type transformers and two 3,000-, two 2,000-, four 1,200- and one 600-amp. oil circuit breakers to Westinghouse.

All of this apparatus is to be delivered about June 1, 1931.

Mormon Tabernacle Bathed in Light

The Church of Latter Day Saints recently celebrated the centennial of its founding in 1830, and for the occasion the Mormon Temple in Salt Lake City was silhouetted at night by means of a modern floodlighting installation

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Municipal Water Rights Apply to Domestic Use

In the opinion of the Oregon State Engineer, prior rights to the appropriation of water by municipalities, as defined by the laws governing such matters, extend only to appropriations for domestic purposes; and cities in this state may not exercise priority privileges in the applications for water permits involving the development of light and power projects. This interpretation of the Oregon water code was offered by Engineer Luper during a hearing before the Reclamation Commission in connection with the application of the Northwest Power Company for permits to appropriate water and develop hydroelectric units on the North Santiam River and Marion Lake, applicant being a subsidiary of the Pacific Northwest Public Service Company, of Portland.

Subsequent to what was supposed by the Reclamation Commission to have been a final hearing in the matter of the Northwest Power Company application and the attendant protests filed by a number of municipalities, the City of Salem now has appeared before the commission with a petition asking that the application of the power utility be denied on the grounds that the city desires to appropriate the water for the development of electricity and cites an amendatory act passed by the 1929 Legislature to substantiate a claim for prior rights to the use of the supply being sought by the private utility. The state engineer holds that priority in this instance would apply in the event the municipality desired the water for purely domestic uses, but otherwise, the law does not differentiate.

The commission postponed final action pending further investigation.

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College of Engineering Formed at Berkeley

Under a reorganization of the engineering colleges of the University of California, Berkeley, the interests of civil, electrical and mechanical engineering will be administered by the faculty of a College of Engineering, of which Prof. Charles Derleth, Jr., has been appointed dean. The College of Engineering will conduct four-year curricula separately in civil, electrical, and mechanical engineering, each leading to the B.S. degree. These may be followed by graduate opportunities for students who wish to remain longer than four years. Graduate study may be pursued for one year, leading to an M.S. degree, or for longer periods, leading to the engineer's degree or the Doctor of Philosophy.

By administering these engineering groups by one faculty, with one dean, it is intended to offer to students the option to remain more than four years, thereby combining to a fuller degree simultaneous studies in civil, electrical and mechanical sciences. In this way students may remain five years or even six years, receiving the B.S. degree in a combination of engineering subjects.

The chairman of the Department of Civil Engineering is Prof. Charles Derleth, Jr. The head of the Department of Mechanical Engineering is Dr. Baldwin M. Woods. Dr. Leonard F. Fuller will head the Department of Electrical Engineering. The College of Mining will continue as in the past under the direction of Dean Frank H. Probert and the Faculty of the College of Mining.

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Tunnel at Bridge River Project Completed

Last month saw the completion of the 2½-mile tunnel which is the first accomplishment in the construction of the British Columbia Electric Railway Company's great hydro-electric development at Bridge River. Two and a half years have been spent in boring the tunnel, representing an outlay of $1,750,000 in labor and material. The work was done by Pacific Engineers Limited.

The tunnel, 16 ft. in diameter, will carry water from Bridge River, 150 miles north of Vancouver, to the site of the power plant at Seton Lake, which is separated from the river by Mission Mountain and is at 1,200 ft. lower level. The first unit, which will develop 54,000 hp. and cost not less than $14,000,000, is expected to commence to deliver power by the end of 1932. The tunnel, however, is of sufficient size to provide for future installation totaling 216,000 hp., after which another tunnel will be bored to bring the capacity of the project to 500,000 hp.

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Engineers Approved for Los Angeles Power Survey

Approval has been given by the Los Angeles Board of Water and Power Commissioners of the three engineers selected by the Chamber of Commerce to make a survey and report on the city's proposed power development program from an engineering standpoint.

The Bureau of Power and Light wishes to place on the ballot at the primary election, Aug. 26, a measure authorizing a bond issue of $19,000,000, as a part of a tentative three-year financial program totaling $31,000,000, $12,000,000 of which is to be derived from power revenue.

The engineers chosen are W. F. Durand, emeritus professor of mechanical engineering, Stanford University; R. W. Sorensen, professor of electrical engineering, California Institute of Technology; and A. V. Guillou, assistant chief engineer of the California Railroad Commission.

Power Consumption of Nation Up This Year

The total consumption of electric power in the United States for the first six months of 1930 was 1.7 per cent higher than for the corresponding period in 1929, and 15.1 per cent above that for the first half of 1928, according to the National Electric Light Association. The total consumption was 37.8 billion kw.-hr.

Total revenues of the electric light and power companies for the six months were 4 per cent higher than for the same period in 1929, and 12.7 per cent above 1928.

The use of electricty by domestic or household customers is considered particularly significant, showing an increase of 13.7 per cent for the first six months of this year over 1929, and 29.8 per cent over 1928. This indicates that electric household appliances continue to be purchased and used in large quantities, although conservative buying is observed by business generally. The consumption per household, which was at the rate of 502 kw.-hr. annually at the beginning of the year, has risen to 524 kw.-hr.

The consumption of electric power by small industrial concerns, stores, theaters, for street lighting, and corresponding uses, was 6.8 per cent above that for 1929, and 24 per cent above 1928.

Large industrial plants, mines, quarries, and bulk power users consumed 2.2 per cent less in the six months just concluded than in the corresponding period in 1929, but the consumption by them was 10.3 per cent higher than for the first half of 1928.

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To Extend Power to Irrigation Project

Power for electrical pumping of water to arrigate additional agricultural lands in Arizona, has been arranged for under a contract recently concluded between the Arizona Edison Company and the Salt River Valley Water Users' Association, both with headquarters in Phoenix. The lands lie about 25 miles south of Phoenix, Tempe and Mesa, and the total area eventually to be irrigated will amount to about 170,000 acres.

By the terms of the contract the Arizona Edison company will serve the pumps with power bought from the Water Users' Association, which will build the necessary power lines and substations for the power company.

The extension program will involve the building of a 110-kv. transmission line at an estimated cost of $188,725; a transformer substation at the terminus of the 110-kv. line at an estimated cost of $126,000; a 44-kv. transmission line approximately 23 miles long, estimated cost $85,000; a transformer substation estimated to cost $41,500; a 44-kv. line about twelve miles long, estimated cost $41,500; switching and protective equipment at an estimated cost of $25,000.

With the extension of power to the irrigation project it is expected that about 20,000 or more acres will be put under cultivation almost immediately.

The contract has 25 years to run and contains a clause whereby it may be extended for ten years more by the power company upon sufficient notice to the Water Users' Association.

Construction is expected to start early in August and will provide employment for from 50 to 60 men.

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Seattle Light's Industrial Power Sales Decline

Electricity sold by the City of Seattle Municipal Light Department for industrial purposes during the first five months of this year shows a decline of over 1,000,000 kw.-hr. compared with the same period for 1929. The total number of kilowatt-hours used during this year was 27,905,271, whereas the total for the same period for 1929 was 29,005,050.

Total power sold by the city for all purposes, including commercial, street lighting, and domestic purposes, showed an increase this year over the first five months of last year. The total for 1929 was 125,082,127, and for the same period this year, 135,297,138 kw.-hr., an increase of 10,215,000, or approximately 8 per cent.

Use of electricity for street lighting purposes for the first five months of this year shows a gain of 1,099,779 kw.-hr., or approximately 14 per cent, over the same period for 1929. The total used for the first five-month period last year was 6,705,372 kw.-hr., and this year 7,690,409 kw.-hr. Cost of power for street lighting purposes averaged 1.95 cents per kw.-hr., this including washing and cleaning of globes.

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Merced-Fresno Tie Line Built in Record Time

Work has been completed on the San Joaquin Light & Power Corporation's new 110-kv. tie-line between its Wilson substation at Merced, Calif., and its Aslan Ave. substation at Fresno, a distance of 48 miles. Wilson substation is the southern terminus of the 165-kv. Brighton-Merced tie-line built in 1926 to connect the Great Western-San Joaquin systems.

The present line is of steel-tower construction, built to carry ultimately two circuits at 220 kv., but now carrying only one 110-kv. circuit of 60,000 kw. Constructed at a cost of $800,000, a record for the San Joaquin company was established when the line was built in four months and 25 days. E. A. Quinn, general superintendent, supervised the work, which was done under the direction of Claude Wilson, superintendent of tower line construction for the San Joaquin company.

P. G. and E. Construction Not Halted by Depression

Business depression has not halted the building activities of the Pacific Gas and Electric Company, according to a recent statement of A. F. Hockenbeamer, president. In May, the last month for which reports are available, the company's payroll was $2,124,000, or $520,000 more than for the same month in 1929. The number of employees was 14,242, an increase of 3,761 over May, 1929.

"We have not halted in a single undertaking in our program of building for the future," said Mr. Hockenbeamer. "We are going right along with our dam, power houses and ditches on our Salt Springs project on the Mokelumne River and there will be no let up on this project until it is finished in 1931 or 1932. Work on our steam-electric plant in San Francisco is likewise moving ahead with full crews at work, under orders to get the first of two large steam turbines ordered for that station into operation this fall.

"California is too large and too rich a state to be permanently affected by any slowing up of business. Depressions here can never be more than temporary," Mr. Hockenbeamer predicted. "Business will turn upward as quickly as it turned downward and, when it turns upward, the Pacific Gas and Electric Company intends to be ready with additional facilities to take care of it."

The figures given by Mr. Hockenbeamer for the Pacific Gas and Electric Company do not include the Great Western Power Company or the San Joaquin Light & Power Corporation, recently acquired. Development work on the properties of these companies is likewise going ahead according to program. No changes are taking place, except where consolidations of offices and departments are necessary to effect economies in operation.

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COMPLETES STEAM PLANT ADDITION —The addition of a new unit, consisting of a 1,200-hp. boiler and a 1,000-kw. turbo-generator set, to the steam plant of the St. Paul and Tacoma Lumber Company, Tacoma, has been completed. The company entered into a contract with the Tacoma Municipal Light Department, under which the city furnished the capital for the power plant addition, to be repaid in auxiliary power during the coming five years. The company has been furnishing the city auxiliary power, as needed, for some years, but has been short of steam capacity for all its plant requirements, and for the generator sets of 2,500 and 3,000-kw. capacity, respectively. The city's investment amounts to $65,000, and, according to Commissioner Ira S. Davisson, enables it to obtain in emergencies several thousand kilowatts of capacity as needed, at 6 mills per kw.-hr. The supply also conserves the Lake Cushman water supply. The city's own steam plant cannot be completed until next fall.

Nevada Valleys Purchase Approved by Commission

The recent purchase of the physical property, contracts, leases, and all property with the exception of the corporation itself, of the Nevada Valleys Power Company by the Sierra Pacific Power Company, has been approved by the Public Service Commission of Nevada. The Nevada Valleys Power Company maintains its headquarters at Lovelock, and serves Battle Mountain, Hazen and Lovelock, Nev. The reduction in the lighting rates, which became effective July 1, when the property was taken over, makes them approximately 30 per cent lower than the former rates.

The Truckee-Carson Irrigation District will benefit by this purchase, as the Sierra Pacific company can utilize the entire generating capacity of the Lahontan dam instead of only half as has been done in the past. According to the Public Service Commission, this will increase the revenue of the district approximately 40 per cent.

The commission holds that the purchase of the Nevada Valleys Power Company lines will be likewise beneficial to the Sierra Pacific Power Company as it will mean a 40 per cent surplus in the power generating capacity which can be turned into its lines through the Virginia City tie-in.

The commission will order that the regular schedules of the Sierra Pacific Power Company for power shall apply to the Truckee-Carson Irrigation District, the City of Fallon (Nev.), the quicksilver mines near Lovelock, and the tungsten mining operations at Mill City.

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Denver Bears' Field to Be Lighted for Night Play

Night baseball will be a Western League feature in Denver, beginning early in August. Arrangements were completed July 17 between Milt Anfenger, president of the Denver Bears, and Public Service Company of Colorado officials for the floodlighting of Merchants Park, home of the local team. Work on the lighting of the field is being rushed so that the installation may be completed in time for the opening of the Denver team's home series on Aug. 7. The equipment, which will cost approximately $11,000 and will require a connected load of 220 kw., consists of 36 Pyle-National 400-watt, four-lamp units, supplemented by six 1,000-watt floodlights.

F. S. Peterson, chief illuminating engineer of the Public Service Company, is in charge of the installation.

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DEPARTMENT OF COMMERCE SURVEY READY THIS MONTH—Tabulation of the results obtained from the Commerce Department's recently instituted semi-annual retail credit survey will be available for distribution by the latter part of August. The electrical appliance stores have been canvassed for the current nation-wide study, which has comprised only the more important of the various types of retail outlets. Since it is not possible to make the semi-annal surveys as comprehensive as the survey covering virtually all lines of business in all sections of the country made by the Domestic Commerce Division in 1927, only 24 leading cities are surveyed in the current study. The figures that will be released this month will cover sales, returned goods, and credit statistics for the first six months of 1930 and the first six months of 1929. The trend that will be indicated will be of particular interest, it is stated, in view of the current recession in business. It will be possible, for instance, to establish with a fair degree of accuracy, the relationship between a slowing down of business and credit losses.

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Sales Skit Shows "Don'ts" of Salesmanship

Such was the title given a little sales skit recently put on by Mrs. R. E. Dean and Milton Burdick of the Coast Counties Gas & Electric Company as a feature of the Watsonville district employees' meeting.

It made such a hit with visiting officials that it was repeated throughout the entire territory of the company, at the various employee meetings held during the past month.

The story covered the entrance of the well-read young matron on the power company sales floor, where the salesman was much more interested in a detective story than the sale of appliances, and developed some amusing dialogue as she insisted on buying a complete electric table service, much to his disgust.

Each manager assured the players that such a thing could not happen in *his* district, but all employees left the meeting with a keener appreciation of the value of personal contact with the customer.

Copies of the skit are available for use by other power companies, and

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FLATHEAD RIVER LICENSE UNREVOCABLE—The Federal Power Commission has denied a petition by Walter H. Wheeler asking that the action granting a license to the Rocky Mountain Power Company for a hydro-electric development on the Flathead River be vacated and the case reopened so he could present additional evidence in support of his application for a preliminary permit. It was held that the action proposed by Mr. Wheeler would involve the revocation of the license issued the Rocky Mountain Power Company. Such action, it was held, would be beyond the commission's power. A petition by Logan W. Marshall that the license issued to the Rocky Mountain Power Company be revoked also was denied.

P. G. and E. Acquires Snow Mountain Properties

Permission has been granted by the California Railroad Commission to the Snow Mountain Water and Power Company to sell its properties in Mendocino, Sonoma and Napa Counties, Calif., to the Pacific Gas and Electric Company for a consideration of $611,666.50, and the assumption by Pacific Gas and Electric Company of all outstanding obligations, including principal and interest on all outstanding bonds.

Snow Mountain Water and Power Company is engaged in the production and sale of power at wholesale only, and the Pacific Gas and Electric Company has already been authorized by the commission to acquire all but five shares of the outstanding common capital stock of that company. (ELECTRICAL WEST, Dec. 1, 1929, p. 320.)

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Edison Company Shows 3% Earnings Gain

Gross earnings of Southern California Edison Company, Ltd., for the first five months of 1930, after giving full effect to rate reductions made Jan. 1 this year, show an increase as compared with the corresponding five months of 1929, according to a recent statement of John B. Miller, chairman of the board. Gross revenues for the first five months this year total $15,896,681.35, compared with $15,422,-984.85 for the same period last year, an increase of $473,696.50, or 3 per cent. Kilowatt hours sold for the first five months were 989,531,704, an increase of 4 per cent. Net earnings for the five months, after deducting operating expenses and taxes, were $9,854,688.61, an increase of $63,761.35. The amount remaining for dividends and depreciation after fixed charges was $6,963,-697.24 for the five months' period, a decrease of $108,483.96 compared with last year.

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Gross revenue for the month of May amounted to $3,421,190.56 as compared with $3,344,562.33 in May, 1929, an increase of $76,628.23. Net earnings after deducting operating expenses and taxes were $2,208,271.02 as against $2,246,926.53 in the previous year, a decrease of $38,655.51. After fixed charges the amount remaining for dividends and depreciation amounted to $1,636,027.51, as compared with $1,696,-317.13 for May of last year.

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W. W. P. CO. SUBSTATION'S CAPACITY INCREASED—The capacity of the Lewiston-Clarkston substation of The Washington Water Power Company has been raised from 3,000 to 6,600 kw. by the addition of two 1,800-kw. transformers.

Pacific Power & Light Plans $17,000,000 Bond Issue and Property Addition

THE maturing on Aug. 1 of the existing first mortgage 5 per cent bonds of the Pacific Power & Light Company, Portland, has been made the occasion for a revamping of the financial and physical structure of the company, chief feature of which will be the issuance of $17,000,000 of first mortgage and refunding 5 per cent bonds dated Aug. 1, 1930, maturing in 1955. In addition, two new issues of $6 preferred stock are provided for, part of which will be offered to the public, while additional common stock will be bought by the American Power & Light Company. The existing first preferred 7 per cent preferred stock of which 58,100 shares are in the hands of the public largely in the territory served by the company, will not be distributed. The new financial structure was made subject to the approval of stockholders at a special meeting held July 25, 1930.

New properties to be acquired by the company from the proceeds of the new financing include a number of properties in Oregon and Washington formerly owned by Inland Power & Light Company and operated by the Pacific company under lease. The sixteen-story public service building in Portland, home of the Pacific company and its sister American Power & Light subsidiaries, Portland Gas & Coke Company and Northwestern Electric Company, is also acquired, as is the Inland Power & Light Company itself. The Inland company, after transferring certain of its holdings direct to the Pacific company, will own two water power projects in Oregon held under federal license, and the Ariel project on the Lewis River, Wash., now under construction.

A portion of the new first mortgage bond issue will be used to retire the outstanding $9,119,000 worth of the present mortgage bonds due Aug. 1 this year. The total amount of the present issue in the hands of the public and in the company treasury for sinking fund purposes, amounts to over $10,000,000, so that the new issue represents an increase in the company's bonded indebtedness of slightly less than $7,000,000, which is amply secured by the additional properties acquired by the company in connection with this financing. The new issue will be underwritten by an investment banking syndicate headed by W. H. Langley & Company, New York, and offered at 96. Earnings of the consolidated properties covered by the bond issue for the year ended May 31, 1930, were 2.6 times the interest requirements.

The new first preferred stock to be authorized consists of 150,000 shares of $6 no par value, cumulative stock, having a liquidating value of $100 and a call price of $110, of which 5,000 shares will be presently offered to the public. A second $6 no par value preferred stock will be authorized in the amount of 75,000 shares for use if and as required in the future for junior financing. The company's present outstanding common stock will be so split as to create 1,500,000 shares of no par value common, of which 1,000,000 shares will be acquired by the American Power & Light Company, representing a substantial increase in equity for the preferred stocks and new bonds. The remaining remnant of an existing 7 per cent second preferred stock, amounting to $190,000 owned by American Power & Light Company, will be retired.

The new capitalization of the company, therefore, upon completion of the proposed financing will be as follows:

	Authorized	Outstanding
First Mortgage Gold Bonds, 5 per cent series, 1955....	*	$17,000,000
7 per cent Preferred stock ($100 par value).....	70,000 shares	58,100 shares
$6 Preferred stock (no par value).....	150,000 shares	5,000 shares
$6 Second preferred (no par value).....	75,000 shares	None
Common stock (no par value).....	1,500,000 shares	1,000,000 shares

* To be limited by restrictive provisions of the mortgage.

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ARIZONA EDISON COMPANY, Phoenix, a subsidiary of People's Light and Power Corporation, reports gross revenues of $1,913,958 for the year ended May 31, 1930, as compared with $1,731,417 for the preceding twelve months. Operating expenses, maintenance and taxes, other than federal income tax, totaled $1,089,721 as against $1,002,749 last year. Gross income amounted to $824,237, which compares with $728,668 for the year ended May 31, 1929.

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CENTRAL PUBLIC SERVICE PREFERRED OFFERED—The Oregon Corporation Department has granted a permit to Albert E. Pierce, of Portland, to sell $7,000,000 in preferred stock to be issued by the Central Public Service Corporation, the holding company of the Pacific Northwest Public Service Company.

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LOS ANGELES GAS AND ELECTRIC CORPORATION has been authorized by the California Railroad Commission to issue $479,500 of Series "J" general and refunding mortgage 5 per cent bonds, at not less than par, for the purpose of depositing them in a sinking fund in lieu of cash.

Northwest Association

M. L. Hibbard Re-elected President of Association

M. L. Hibbard, vice-president and general manager, Idaho Power Company, Boise, and last year's president of the Northwest Electric Light and Power Association, has again been made president of that organization to fill the vacancy caused by the recent death of M. W. Birkett of The Washington Water Power Company, Spokane, who had been elected president for the current association year. Mr. Hibbard's election occurred at a meeting of the executive committee of the association in Portland July 18, 1930.

M. L. HIBBARD

Following the election, Mr. Hibbard appointed section chairmen as follows: Accounting, R. H. Jones, Utah Power & Light Company, Salt Lake City; Commercial, G. E. Sullivan, Pacific Northwest Public Service Company, Portland; Engineering, E. F. Pearson, Northwestern Electric Company, Portland. Berkeley Snow, ELECTRICAL WEST, Portland, was re-appointed secretary.

At the same meeting, two new members-at-large of the committee were elected to fill vacancies caused by Mr. Birkett's death and the resignation of R. M. Boykin, Puget Sound Power & Light Company, Seattle. These two members-at-large were J. E. E. Royer, assistant general manager, The Washington Water Power Company, Spokane, and C. M. Brewer, vice-president and general manager, The California Oregon Power Company and the Mountain States Power Company, Medford, Ore.

In regretfully accepting the resignation of Mr. Boykin, who leaves the Puget Sound company to take a position with the Electric Bond & Share Company, New York, the committee took action to confer honorary membership on him in recognition of services he has performed for the association and of the high esteem in which he was held by his colleagues.

P.C.E.A.

Year's Activities Outlined by Commercial Section

Plans for the activities of the four bureaus of the Commercial Section, P.C.E.A., during the association year just commenced, were formulated at a meeting of the executive committee of the section held June 19.

The chief effort of the Lighting Bureau will be to co-ordinate the lighting men of the industry into a more effective working body, according to G. H. P. Dellman, chairman. Six committees will carry on the work of the bureau, as follows: Educational lighting committee, home lighting committee, commercial lighting committee, sign and advertising committee, street and highway lighting committee, and industrial lighting committee.

Further revision of the Agricultural Power Hand Book incorporating data on competitive power, formulation of a standard form on heating jobs, revision of the Heating Hand Book, further study of oil field problems with relation to electrical application, and special study of the d.c. electric drilling plan are subjects on the program of work outlined for the General Power Bureau, under the general direction of R. C. McFadden, chairman.

Two new committees have been added to the Merchandising Bureau, headed this year by H. H. Courtright, chairman. One of these will deal with the problem of radio sales, and the other with health appliance sales.

The appliance committee of the Merchandising Bureau contemplates the preparation of a chart showing the monthly demand peaks of the major domestic electrical appliances. With this chart before him, the dealer will be able to determine what appliance will in all likelihood sell best during any given month.

A study of vacuum cleaners and washing machines, from a standpoint of their ultimate distribution to the public, will be made by the motor-driven appliances committee. The use of vacuum cleaners for mothproofing and for the prevention of moth damage to fabrics will be studied and reported upon by this committee.

Straightening of the year's range sales curve by the organization of stimulating sales campaigns during the months of slack and off-peak sales will be a main endeavor of the range committee. An investigation will be made of the development by Glenn L. Jackson, of The California Oregon Power Company, of a detachable and self-contained service unit for the ready connection and disconnection of domestic electric ranges and water heaters.

Thorough surveys of the water heater, air heating and commercial cooking markets, with a view to stimulating public interest in these installations, will be made by the three committees whose interest is in these subjects.

The refrigeration committee will work towards a more widespread use of electric refrigeration by power company employees. Studies will be made on food conservation, mold growth and other pertinent subjects, on which papers will be prepared and presented from time to time.

Dates of the first two conclaves to be held by the Commercial Section have been announced as Oct. 8-9, 1930, for the first conclave, to be held in San Francisco, and Jan. 8-9, 1931, for the second meeting, to take place in Los Angeles. The third conclave will be held in Fresno in March, no definite date having so far been set.

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ENGINEERING SECTION SETS MEETING DATE—Sept. 10-12 has been announced as the tentative date for the first conclave of the Engineering Section, P.C.E.A., to be held in San Francisco.

Meetings

Coming Events

American Institute of Electrical Engineers—Annual Pacific Coast convention, Portland, Sept. 2-5, 1930.

Commercial Section meeting, San Francisco, Oct. 8-9, 1930.

Engineering Section meeting, San Francisco, Sept. 10-12 (tentative).

International Association of Electrical Inspectors, Northwestern Section—Annual convention at Hotel Leopold, Bellingham, Wash., Aug. 25-27, 1930.

Southwestern Section—Annual convention at Hotel Maryland, Pasadena, Calif., Oct. 6-8, 1930.

National Electric Light Association—Fifty-fourth convention and exhibition, Atlantic City Auditorium and Convention Hall, Atlantic City, N. J., June 8-12, 1931.

Rocky Mountain Division meeting, Albuquerque, N. M., Oct. 20-22, 1930.

National Electrical Wholesalers Association, Pacific Division—Thrice-yearly convention at Agua Caliente, Mexico, Oct. 8-10, 1930.

Officers Elected by I.E.S. San Francisco Chapter

William Hanbridge, supervisor of the Commercial and Industrial Lighting Bureau, San Francisco division, Pacific Gas and Electric Company, was elected chairman of the San Francisco Bay Cities Chapter of the Illuminating Engineering Society recently. Other officers elected were: Leonard Hobbs, district manager of the Edwin Guth Company, vice-chairman; Roy Myers, Curtis Lighting Inc., secretary-treasurer. The board of managers includes Clark Baker, National Lamp Works, Oakland; James Mundstock, the Frink Corporation; and Carl Martin, of Benjamin Electric Manufacturing Company.

The nominating committee consisted of James R. Cravath, illuminating engineer, chairman; James Mundstock, and Clark Baker.

Meetings during the summer months were discontinued but will be resumed in September on Friday noons at the Engineers' Club, San Francisco.

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Los Angeles Radio Show to Open Aug. 31

The eighth annual Los Angeles Radio Show will be held in Los Angeles, Calif., in the Ambassador Auditorium, Aug. 31 to Sept. 6, inclusive, under the auspices of the Radio and Music Trades Associations of southern California. Waldo T. Tupper is managing director of the show, and all communications to him should be addressed Box H, Ambassador Station, Los Angelese, Calif. A. G. Farquharson is secretary of the Radio and Music Trades Associations.

A preview, exclusively for jobbers, dealers, manufacturers, manufacturers' agents, foreign buyers, and others directly connected with the radio industry, will be held on Sunday, Aug. 31.

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GOLF TOURNAMENT FOR SEATTLE CLUB—Plans for a proposed match play golf tournament to be held under the auspices of the Electric Club of Seattle, with 32 members participating, are under way, with Reno Thatcher chairman of the committee in charge. Other members of the committee include Herb Boring of the General Electric Company; Harry Byrne, Jr., of the North Coast Electric Company; Walter Funfsinn, Seattle Lighting Company; and A. J. Lutz, General Electric Supply Corporation.

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ATLANTIC CITY CHOSEN FOR NEXT N.E.L.A. CONVENTION—The 54th convention and exhibition of the National Electric Light Association will be held in the Atlantic City Auditorium and Convention Hall, Atlantic City, N. J., June 8-12, 1931.

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UTAH LEAGUE TO HAVE ANNUAL OUTING—The date for holding the annual outing of the Electrical League of Utah has been set for Aug. 14. Lagoon, Utah, is the place chosen for the get-together.

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JOBBERS TO MEET AT AGUA CALIENTE—The thrice-yearly convention of the Pacific Division, National Electrical Wholesalers Association, will be held Oct. 8-10, at Agua Caliente, Mexico.

Personals

Dr. Fuller to Head U.C. Electrical College

Dr. Leonard F. Fuller, executive vice-president of the Federal Telegraph Company, with headquarters in Palo Alto, Calif., has been appointed chief professor of electrical engineering at the University of California, Berkeley. Dr. Fuller's appointment is one of several steps recently taken by the university to carry out the plan of reor-

DR. LEONARD F. FULLER

ganizing the administration of the engineering college, reported elsewhere in this issue of ELECTRICAL WEST.

Dr. Fuller was graduated as a mechanical engineer from Cornell University, and holds the degree of Doctor of Philosophy from Stanford University. A short time after his graduation from Cornell in 1912, he went to San Francisco and entered the engineering department of the Federal Telegraph Company of which he was made chief electrical engineer in 1913. He remained in that capacity until 1919 and developed and built the high-powered trans-oceanic radio apparatus furnished the United States Navy under contract during those six years. Then he became assistant manager of the Ohio Insulator Company, Barberton, Ohio, but in 1920 returned to San Francisco and entered private practice as a consulting electrical and communications engineer. In 1922 and 1923 he installed the carrier-current telephone equipment on the Caribou line of the Great Western Power Company and the same type of equipment on the Pit River lines of the Pacific Gas and Electric Company, the latter being the longest and highest-voltage carrier channels in the world at that time. In 1923 he went to Schenectady, N. Y., to engage in carrier-current research for the General Electric Company. Three years later he returned to San Francisco where he spent about two and a half years in various types of research work for the engineering department of the General Electric Company, leaving at the end of that time to take up his present executive position with the Federal Telegraph Company, which he will retain.

Dr. Fuller, who is a Fellow of the American Institute of Electrical Engineers, has always taken an active part in the affairs of that organization, and at the present time is chairman of the San Francisco Section. He is also a Fellow in the Institute of Radio Engineers and during 1928-29 was chairman of its San Francisco Section.

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Leaves Puget Sound Co. for Electric Bond & Share

R. M. BOYKIN, for many years associated with the Puget Sound Power & Light Company and affiliated companies in the Northwest, and more recently occupying the position of manager of the central district of the Puget Sound company in Seattle, has resigned his position with that company, effective this month, to accept a position with the Electric Bond & Share Company, New York. It is understood that Mr. Boykin's assignment in that company will closely associate him with Frank Silliman, Jr., a vice-president whose activities are largely centered on various properties in the states of Montana, Washington and Oregon that are receiving some measure of Bond & Share supervision.

Mr. Boykin's entry into the electrical industry followed soon after his graduation in electrical engineering from the Alabama Polytechnic Institute in 1897. He came to Oregon in 1911 as owner

R. M. BOYKIN

and operator of the electrical property at Hillsboro. Through a series of mergers this property became a part of the Puget Sound Power & Light Company and Mr. Boykin was named manager of the southern district of that company with headquarters in Portland. In 1924 he was transferred to Seattle as manager of the central district.

He has long been active in A.I.E.E. and Northwest Electric Light & Power Association circles, having been president of the latter association on two different occasions.

Mr. Boykin's successor as manager of the central district of the Puget Sound company will be L. R. Coffin, former manager of the company's Wenatchee district office. L. M. Shreve, formerly sales manager of the Wenatchee office, succeeds Mr. Coffin as Wenatchee district manager.

▼

General Manager of Grays Harbor Co. Appointed

SUCCEEDING the late W. W. Briggs as head of the electrical operations on Grays Harbor, J. R. Snider, veteran southwest Washington utility executive, is the new vice-president and general manager of the Grays Harbor

J. R. SNIDER

Railway & Light Comany, Aberdeen, Wash. Mr. Snider, who has been manager of the Willapa Electric Company, Raymond, Wash., for many years, will retain his position as head of the neighboring utility in addition to his responsibilities as general manager of the Grays Harbor company. He also will continue as active head of the Western Washington Electric Light & Power Company, Montesano, Wash. The Grays Harbor Railway & Light Company, the Willapa Electric Company, and the Western Washington company all are affiliated properties of the Federal Light & Traction Company which recently became identified with the Cities Service organization.

The new general manager, through his connection with the Willapa Electric Company and his leadership in the movement to develop the hydro-electric resources of North River, occupies a prominent position in the electric light and power industry of Washington. He is well known on Grays Harbor and is familiar both with the problems of the twin harbors area and with the operations of the Grays Harbor Railway & Light Company.

Mr. Snider has been connected with the electrical industry in western Washington since 1912 when he became identified with the Sanderson & Porter interests in development work on Willapa Harbor. He became manager of the Willapa Electric Company in 1917 and has continued in that capacity since that time. He has been actively identified with the effort toward a North River hydro-electric development since the inception of that project. The or-

iginal filings for permit to utilize the river for production of electrical power were made in his name, and the activities leading toward its development since have been under his supervision. As head of the Western Washington Electric Light & Power Company, construction of the Raymond-Cosmopolis section of the Grays Harbor-Willapa Harbor electric transmission line was carried on under his direction. The same company completed all development work preliminary to application for permanent permit for development of the North River project, and has applied to federal authorities for permission to build a plant there.

Mr. Snider is a native of Wisconsin and a graduate of the law school of the University of Wisconsin, having been admitted to the bar in that state. He is a member of the Elks Lodge of Raymond, of the Rotary Club and Willapa Harbor Country Club.

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J. B. Ledlie Joins Western Public Service Company

J. B. LEDLIE, since 1924 vice-president of the Mesilla Valley Electric Company, Las Cruces, N. M., has been transferred to Holdredge, Neb., where he will assume general supervision over the properties of the Western Public Service Company, situated in about fifty Nebraska towns. The transfer became effective July 1.

Before being sent to Las Cruces, Mr.

J. B. LEDLIE

Ledlie was sales manager of the El Paso Electric Company in El Paso, Texas, for about three and a half years. Prior to that, he was affiliated with the Northern Texas Traction Company, Fort Worth, as an electrical engineer.

C. P. Spellman, head of the El Paso Electric Company's statistical department, has been appointed to succeed Mr. Ledlie as vice-president of the Mesilla Valley Electric Company at Las Cruces. Mr. Spellman entered the El Paso organization as distribution engineer in May, 1925. Subsequently he became secretary to the manager. In April, 1929, he was selected to compile the data for a cost analysis of the company, with particular reference to light and power rates. Following a rate reduction in October, 1929, he was placed at the head of the company's newly organized statistical department, to the success of which his broad knowledge of company matters in general has contributed materially.

C. P. SPELLMAN

Mr. Spellman first entered the Stone & Webster organization in April, 1917, with the Cape Breton Electric Company, Ltd., at Sydney, Nova Scotia, as manager's clerk. In July, 1918, he returned to the States to enter the World War. Following the armistice, he was sent to the Lowell Electric Light Corporation, Lowell, Mass. At Lowell Mr. Spellman had charge of the engineering office and did valuable work in organizing the department.

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FRANK PURSE, engineer of Tacoma, Wash., and a former member of the Civil Service Commission of that city, has been appointed state supervisor of public utilities, a post that has been vacant since last August, when C. Rea Moore resigned.

FRED DESILVIA, general foreman of underground lines for the Puget Sound Power & Light Company, Seattle, Wash., has left that company's employ after nearly 30 years of service, to more to California, an action made necessary by the condition of his health.

A. U. BRANDT, electrical engineer, San Francisco Division, Pacific Gas and Electric Company, has been retired on pension after 31 years in service. Paul E. Chapman, who has been assistant electrical engineer under Mr. Brandt, has been appointed to fill the vacancy. Under a slight reorganization following Mr. Brandt's retirement, Mr. Chapman's title will be that of division superintendent (San Francisco).

A. L. POLLARD has been appointed superintendent of the steam division of the Puget Sound Power & Light Company, Seattle, reporting to John Harrisberger, general superintendent of power.

C. F. BRITTAIN, during the past year manager of the Electrical Happiness Store, operated by the San Diego Consolidated Gas & Electric Company, San Diego, Calif., has been made supervisor of washer, ironer and cleaner salesmen for the company. Earl P. Warren, since August, 1929, salesman in the San Diego store, has been appointed to succeed Mr. Brittain as manager.

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J. B. Brokaw Resigns From Oregon Utility

HAVING served since 1924 as chief engineer of the Eastern Oregon Light & Power Company, Baker, Ore., J. B. Brokaw has resigned to accept the position of assistant manager with the Peoples West Coast Hydro-Electric Corporation, California Public Service Company, and Western States Utilities Company with headquarters in Portland. These companies are subsidiaries of the Peoples Light & Power Company, New York.

A native of Illinois, Mr. Brokaw entered the electrical industry in the operating department of the Berlin Light, Heat & Power Company, Berlin, Wis., in 1902, and later was engaged in construction work as a lineman and line inspector for the Commonwealth Electric Company, Chicago. In 1908 he went to Pocatello, Idaho, and for eleven years was local manager for the Idaho Consolidated Power Company at American Falls and Blackfoot. In 1919 he went to Minot, N. D., as division manager of the Northern States Power Company, where he remained two years. He then joined the Eastern Oregon Light & Power Company as division manager at La Grande, Ore., and later was transferred to the engineering department at Baker, assuming the position of chief engineer in 1924.

J. B. BROKAW

The companies of which Mr. Brokaw will now be assistant manager operate scattered properties in Nevada, California, Oregon, Washington, Idaho, Utah, and Wyoming.

Obituary

WALDO C. BRYANT, chairman of the board of The Bryant Electric Company, Bridgeport, Conn., and founder of the company, died at Colorado Springs, Colo., July 5.

Contractor Dealer Inspector

Laurence Davis Tells of Trade Rules

PROPOSED rules of fair trade practice in the electrical contracting industry which shall have the approval and support of the Federal Trade Commission have proved the subject of the greatest interest among the many topics discussed by Laurence W. Davis, managing director, Association of Electragists, International, on his tour of Western cities. These rules are to be a subject of major discussion at the A.E.I. convention in Milwaukee, Aug. 18-20, 1930, and then will be submitted to the Federal Trade Commission for its approval.

Since these rules will be made the subject of special articles in the near future, no further description of them will be made here. Mr. Davis in each locality also discussed with the electrical contractors in their meetings some of the important problems faced by the contracting industry and the work of the A.E.I. in dealing with these. He also pointed out the strength of the chapter form of organization and the responsibilities that the chapters have of dealing promptly and constructively with subjects affecting all the contracting industry and combining the efforts of the local chapters on any such problem with those of the A.E.I. headquarters.

At general industry meetings, such as are held by numerous electric clubs and leagues, Mr. Davis spoke specifically of the needs for close industry cooperation with respect to the treatment of local issues. In general he told also of the scope of the work being done for the contractors by their organization for the improvement of the electrical business. Besides such meetings Mr. Davis in each locality visited with the leaders of the industry and exchanged ideas and viewpoints with them.

Beginning at Denver, Colo., at a meeting of the Electrical League of Colorado at the Denver Athletic Club, June 27, Mr. Davis next spoke that evening to the Denver Electrical Contractors Association.

At Salt Lake City Mr. Davis spoke to the Electrical Development League of Utah on June 30, and to the contractors' association the same evening.

From Salt Lake Mr. Davis arrived in California at Riverside, from where he was met by the California Electragists, Southern Chapter, and together they motored to San Diego, where, after a luncheon meeting at Agua Caliente, an evening meeting of the San Diego branch was held. This was on July 2. The July 4 week-end was spent at Hermosa Beach. On July 8 the Southern Chapter meeting was held at Hotel Alexandria, Los Angeles, with 100 contractors in attendance. An industry meeting with executive representatives of the industry at large was held on July 9 at the Jonathan Club. Mr. Davis on July 10 attended the Estimators Section luncheon, after which he left for a meeting at Santa Barbara attended by Santa Barbara and Ventura County Electragists.

July 11, at noon, an industry meeting was held in Bakersfield, after which Mr. Davis, accompanied by Glenn Arbogast, state president of the Electragist organization, H. H. Walker, past president, and Frank Connolly, executive secretary of the Southern Chapter, attended a meeting of the Kern and Tulare Counties electrical contractors and dealers, and hardware and furniture dealers, at the Tulare Hotel. The next day a meeting was held at noon with the electrical contractors of Fresno.

Arriving in San Francisco on July 13, Mr. Davis, Mr. Arbogast, Mr. Walker and Mr. Connolly attended the San Francisco Electragists' meeting, July 14. On the following Monday Mr. Davis addressed the San Francisco Electrical Development League at noon and that night a meeting of the Northern Chapter California Electragists at the Whitcomb Hotel.

Following this, Mr. and Mrs. Davis spent several days at Lake Tahoe as guests of Clyde Chamblin, past president of the A.EI. and the California association, and Mrs. Chamblin.

Mr. Davis's schedule for the return trip to New York via the annual convention at Milwaukee, contemplates the following meetings in the Northwest, after leaving California Aug. 1:

Portland, Monday, Aug. 4, a meeting under the auspices of the Oregon Electragists; Seattle, Tuesday, Aug. 5, a meeting under the auspices of the Seattle Contractor and Dealers Association; Vancouver, B. C., Wednesday, Aug. 6, a meeting under the auspices of the Vancouver Electrical Contractors and Dealers Association; Spokane, Friday, Aug. 8, a meeting with the Spokane electrical contractors and dealers.

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Ask Manufacturers to Standardize Pipe

That standardization of the metallic-coated or so-called "white" conduit and fittings is widely favored by contractors is indicated in resolutions adopted by many Electragist chapters urging immediate industry consideration of such a step toward simplification and economy. Copies of the resolutions have been sent to the National Electrical Manufacturers' Association stressing the practical and safety qualities of white pipe and fittings as well as the saving to be effected from standardizing in the manufacture and distribution of only a single type of finish for conduit and fittings.

This movement is part of the program for standardization and simplification of wiring materials being developed by the A.E.I. committee on standardization, of which Clyde L. Chamblin, of San Francisco, is chairman.

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DICK PEW and his Advance Electric Company, Electragists of Bakersfield, have recently finished the wiring of the new Haberfield Building in that city. Mr. Pew is the secretary of the local Electragists' branch.

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Inside of the Shell

The "inside" story of the construction of the Shell Building, San Francisco, would tell much of the electrical contractor, Charles A. Langlais and of his crew, and how the multitude of details were handled quickly and efficiently to speed the job. Mr. Langlais personally handled the service of supply, the despatching of materials so as to have them on the job just in time to be used. There was no place to store materials on this swiftly moving job. Deliveries of materials had to be timed. In so far as possible the materials and fittings needed for a certain location or operation had to be pre-assembled and delivered in units for quick installation.

To Frank Lynn (center of the group) fell the important task of superintending the actual construction, fitting operations to the other crafts working on the job, and keeping ahead of them. Because the job involved some untried and absolutely new construction features he was called upon to decide quickly and to pioneer methods. He directed and planned the work of a crew of about 40 men all during the job. With him are seen Allan Babcock, left, and A. F. Burke, right, draftsmen who kept a graphic record of the work on drawings as the job progressed.

Ordinance Protects Local Group

An ordinance recently referred to the San Jose, Calif., City Council is designed to protect local labor and contractors, at least in the letting of contract work for the city.

The proposed ordinance provides that workers on municipal projects or those hired in the various departments of the city shall be citizens of the United States or shall have declared their intention of becoming citizens. It also provides that "preference in the performance of labor shall be given to persons who have actually resided in the city for a period of one year next preceding the date of their engagement to perform labor thereunder." The measure also provides that preference be given local bidders in the awarding of contracts.

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THE CITY ELECTRIC & FIXTURE COMPANY, 216 James St., Seattle, has received award of contract from the Port of Seattle Commission for the installation of electric wiring in four warehouses being built at Smith's Cove.

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THE CITY of Yuma has recently installed a new downtown lighting system.

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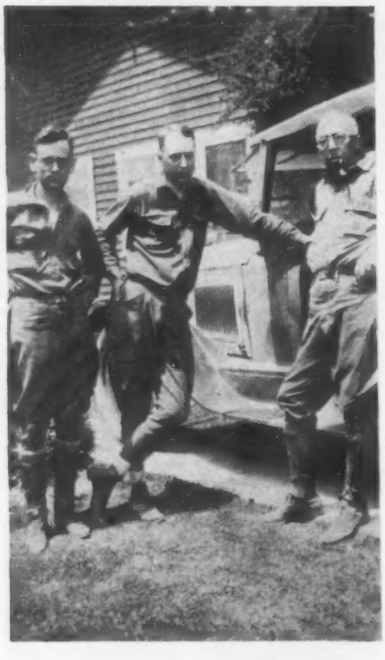
Fishermen Three



The great outdoors often calls to this trio; Marold West and Eddie Ellis, G. E. Company, and Joe Case, manager of Quality Electric Works, Los Angeles

CONTRACT for supply of a switchboard for the new power plant under construction at the Empress Hotel, Victoria, B. C., was awarded to the Amalgamated Electric Corporation of Vancouver by the Canadian Pacific Railway, through James Muirhead, Vancouver, B. C., electrical consulting engineer in charge of the electrical end of the project. This contract also includes installation. Four tenders were received for the switchboard. The board will control one Diesel and four steam units, and will serve 30 feeder lines to all the buildings in the Empress Hotel and Crystal Gardens groups.

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NOTICES MAILED to contractors and electrical firms in Denver recently announced that Electrical Workers Union No. 68 would not consider Saturdays and Sundays working days. The union has filed with the Colorado Industrial Commission notice of a demand for a five-day week. O. B. Noxon is president of the union.

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WHEN THE SAMARKAND HOTEL, the famous hostelry of Santa Barbara, found it needed additional electrical capacity for various demands, the Mission Electric Company of that city installed the new switchboard and transformer vaults for it recently.

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Northwest Inspectors Announce Program

The advance program of the Fifth Annual Convention of the Northwest Section, International Association of Electrical Inspectors, to be held at Bellingham, Wash., Aug. 25-27, 1930, indicates that a busy and entertaining time will be provided for the delegates. The three days of business sessions will be devoted in part to hearing speakers on subjects pertinent to inspection and in part to receiving and acting on committee reports with a view to developing recommendations from this part of the country to the Electrical Committee. The annual golf tournament, a motor trip to Mount Baker Lodge, and the annual banquet constitute the principal entertainment features, while special entertainment is being provided for the ladies.

Among the principal speakers from outside the ranks of the Northwest Section will be R. M. Boykin, Puget Sound Power & Light Company, Seattle; A. Penn Denton, engineering director, National Electrical Manufacturers' Association, New York; and William S. Boyd, president, International Association of Electrical Inspectors, Chicago.

Committees of the electric club of Whatcom and Skagit Counties, headed by H. S. Jenkins, chief electrical inspector, Bellingham, are in charge of local arrangements. Headquarters will be established at the Hotel Leopold.

Stockton Inspector Dies Suddenly

In Stockton, Calif., nothing electrical was undertaken without the participation of Frank A. Morrell, known to the

FRANK A. MORRELL

industry there and to electrical inspectors in California everywhere as "Mickey." It was a shock, not only to his many friends and associates in Stockton, therefore, but in inspection circles throughout the state, to learn that on July 6, 1930, Mr. Morrell passed away quite suddenly following a heart attack.

Mr. Morrell had been associated with the electrical industry practically all of his life, beginning as a wireman and fourteen years ago joining the inspection staff of the City of Stockton. Eleven and a half years of those fourteen years he was chief electrical inspector for Stockton. He was appointed to this position on Jan. 1, 1919.

Mr. Morrell was an active member in the California Association of Electrical Inspectors since its inception, and was one of its founders. Of late years he had devoted much of his attention to the association's committee work, but was still a member of the Southwestern Section, International Association of Electrical Inspectors.

A successor to Mr. Morrell as chief inspector has not yet been announced by the Stockton council.

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AMONG THE RECENT big jobs in southern California, the Newbery Electric Corporation, of Los Angeles, has been a contractor for the new Ford plant at Long Beach, the county hospital in Los Angeles, the bath house and bathing pool at Agua Caliente, and the new hotel and casino at Ensenada, Mexico. The company also installed the transmission line from the border at Tia Juana to Ensenada.

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FORT COLLINS, Colo., will be served for electrical inspection by T. P. Treadwell, chief of the fire department, who has been appointed superintendent of the building inspection department of the city. He is to be assisted by W. A. Johnson, superintendent of the municipal street railway.

Schweitzer Conrad Merge With Cutler-Hammer

Announcement is made by Cutler-Hammer, Inc., Milwaukee, Wis., of the acquisition on July 1 of all the common stock of Schweitzer & Conrad, Inc., Chicago, manufacturers of high-voltage equipment.

Schweitzer & Conrad will continue to operate as an independent manufacturing and selling unit. No changes in organization or personnel will be made with the exception of the appointment of Beverly L. Worden, president of Cutler-Hammer, Inc., as president of Schweitzer & Conrad also. Mr. Conrad and Mr. Schweitzer have been retained as consulting engineers and will continue their interest in the management as members of the board of directors.

Other members of the new Schweitzer & Conrad board are F. R. Bacon, who is chairman of the Cutler-Hammer board, and F. L. Pierce and Louis A. Lecher who are also members of the Cutler-Hammer board.

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W. F. Price Heads Cutler-Hammer in Los Angeles

Walter F. Price, for the past year a member of the sales staff of the San Francisco office of Cutler-Hammer, Inc., in charge of sales of Cutler-Hammer wiring devices and Trumbull-Vanderpoel Manufacturing Company's safety switch line, has been appointed manager of the Los Angeles branch of

WALTER F. PRICE

Cutler-Hammer, which includes in its territory southern California and Arizona.

Mr. Price served at one time as executive secretary of the California Electragists, and prior to that was electrical equipment expert for the California Electrical Co-operative Campaign, which became the California Electrical Bureau.

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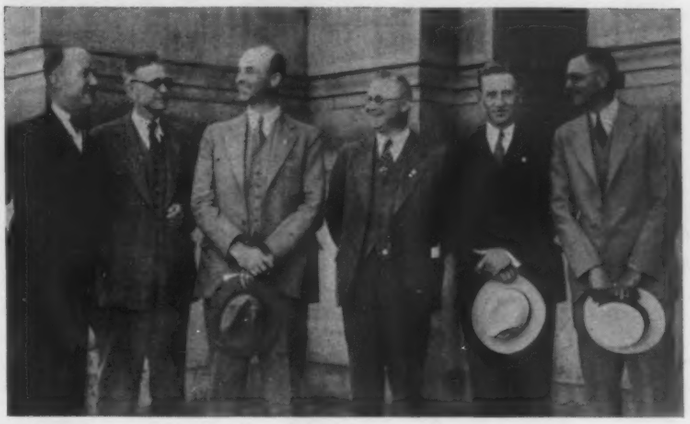
A. LESCHEN ROPE COMPANY, manufacturer of wire rope and wire rope tramways, with head office and factory at St. Louis, Mo., has moved its Pacific Coast offices from the Monadnock Building to 520 Fourth St., San Francisco.

Four Wolves—Two Sheep



ALL-SEATTLE line-up in front of the San Francisco Civic Auditorium during the recent N.E.L.A. convention. Left to right are: Charles H. Cutter, Pacific Electric Manufacturing Corporation; H. L. Eicher, Eicher & Bratt; J. E. Hawe, electrical engineer with the Great Northern Railway; Joe Hellenthal, Puget Sound Power & Light Company; J. G. Miles, Westinghouse; and T. S. Wood, of T. S. Wood Company.

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San Francisco Subsidiary Formed by Manufacturer

Davis Emergency Equipment Company, Ltd., a wholly-owned subsidiary of the Davis Emergency Equipment Company, of New York, has recently been formed in San Francisco, with headquarters at 1268 Mission St.

The Davis Emergency Equipment Company, Ltd., will act as exclusive Western representative for the sale of first-aid kits and supplies, gas protection equipment, linemen's safety equipment and trouble finders manufactured by the Davis Emergency Equipment Company, Inc. The California company also will act as representative for the miscellaneous safety equipment, safety clothing and safety shoes sold by Bullard-Davis, Inc. (Delaware), another Davis Emergency Equipment Company subsidiary. Bullard-Davis, Inc. (Delaware), is in no way connected with E. D. Bullard Company, of San Francisco, successor to Bullard-Davis, Inc., of California.

The new San Francisco office is under the management of Herbert Brendlen, and Daryl Potter has been appointed to the sales force in that city.

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LAMINATED BAKELITE in sheets, rods and tubes, under the trade name of "Lamicoid," has recently been placed on the market by the Mica Insulator Company, of New York and Schenectady. A full stock of this new product is being carried on the Pacific Coast by the Electrical Specialty Company, Inc., agents of the Mica Insulator Company in this territory, at its stockrooms in San Francisco, Los Angeles and Seattle.

TO REPRESENT DIEHL COMPANY IN WEST—The Diehl Manufacturing Company, electrical division of The Singer Manufacturing Company, Elizabethport, N. J., has appointed the Incandescent Supply Company, 726 Mission St., San Francisco, and the Graham-Reynolds Electric Company, Los Angeles, as distributors of its commercial fans and exhaust wheels in northern and southern California respectively. In Arizona, the Palace Hardware & Arms Company, of Phoenix, and F. Ronstadt Company, Tucson, will be in charge of commercial fan sales only for the Diehl company.

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ECK L. BAUGHN has been appointed sales manager of The Bradford Pump Manufacturing Company, San Jose, Calif. Mr. Baughn is well known to the pump fraternity of the Pacific Coast, having been actively engaged in sales work with pump manufacturers in this territory for many years.

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WESTINGHOUSE TO MAKE MEDICAL APPARATUS—A $2,000,000 corporation for the development and application of X-ray and electro-medical apparatus has been organized by the Westinghouse Electric & Manufacturing Company, East Pittsburgh.

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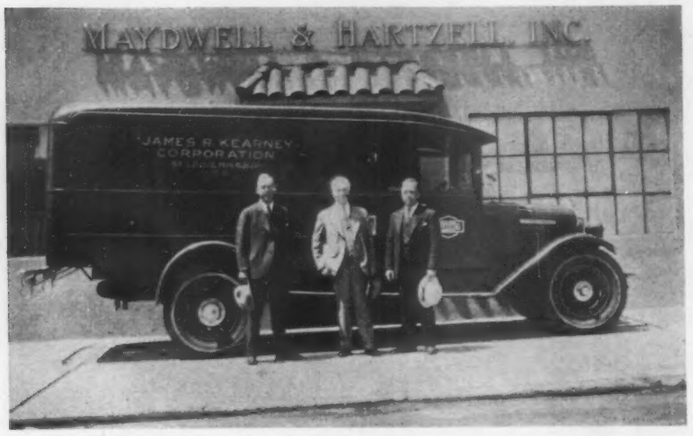
GRAYBAR MOVES TO NEW SEATTLE BUILDING—The Seattle branch of the Graybar Electric Company, Inc., formerly at 84 Marion St., has moved to the Graybar Building on King St. and Occidental Ave., a $75,000 structure built exclusively for the use of the company. J. L. Colwell is manager.

Demonstrator Truck Ends Five Months' Tour



ARRIVING just in time for the recent N.E.L.A. convention at San Francisco, this demonstrator truck of the James R. Kearney Corporation, ended a five months' trip over the southern route from the Kearney factory in St. Louis. M. T. Tipsord, specialist in Kearney products, was in charge of the traveling demonstrator. Standing in front of the truck upon its arrival at the headquarters in San Francisco of Maydwell & Hartzell, Inc., Pacific Coast representatives of the James R. Kearney Corporation, are C. A. Maydwell, H. F. Hartzell, and H. S. DeLancie, Pacific Coast sales specialist of the Kearney company. The truck will return East in December.

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Handles Armstrong Sales in San Francisco

Claude A. Pearson, formerly with the General Electric Supply Corporation, Oakland, Calif., has been appointed resident salesman in San Francisco, with headquarters at 108 Ninth St., for The Armstrong Electric & Manufacturing Corporation, Huntington, W. Va., manufacturer of electric ranges. Mr. Pearson's territory will comprise northern California, according to an announcement of J. B. Swan, Pacific Coast manager.

The appointment of Mr. Pearson is in line with the new policy adopted by the company which, under the leadership of W. L. Goodwin, president, is expanding its sales activities and has appropriated a large sum for national advertising. Mr. Swan's headquarters are at 420 East Eighth St., Los Angeles, and the company is represented in the Pacific Northwest by Roy Dryer, formerly sales manager for the Stubbs Electric Company, Portland, with headquarters at 91 Connecticut St., Seattle.

▼

Three New G. E. Films Are Released

Three recent films added to the General Electric Company's library of motion pictures include "The Electric Ship," "Opportunity," and "The Conquest of the Cascades."

"The Electric Ship" takes its audience on a trip from New York to San Francisco aboard the palatial electric liner, *Virginia*. This film is available as a one-reel picture with synchronized music, or without sound as a two-reel picture.

"Opportunity" is a two-reel film depicting the high school graduate at work in the various departments of the General Electric Company where training courses are maintained. This film is lent free of charge except for transportation charges.

The story of the new eight-mile Cascade Tunnel is told in "The Conquest of the Cascades," which shows how electricity, compressed air and explosives have conquered the barrier of this mountain range to expedite railroad transportation. This film is available either with or without sound. In the sound version the story is told by an unseen narrator against an orchestral background. The silent version tells the same story with the aid of subtitles. Either version is lent free of charge except for the cost of transportation.

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PACIFIC COAST MANAGER FOR PROCTOR & SCHWARTZ—Walter Mead has been appointed manager of sales on the Pacific Coast for the Proctor & Schwartz Electric Company, Cleveland. Mr. Mead's headquarters are at 409 Call Building, San Francisco.

No Golf—No Job

Right: W. B. Sawyer, Jr., of the U. S. Steel Products Company (right), swapping impressions of the N.E.L.A. convention in front of the San Francisco Civic Auditorium with R. W. Murphy, of the Pacific Coast Division of the Westinghouse Lamp Company, San Francisco. Mr. Sawyer is lamenting the lack of an official convention golf tournament

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An appliance display room in the General Electric Supply Corporation's new Long Beach Building. The clocks are Telechrons, and the cooking and heating appliances are Hotpoints

New Products

Door Opens Automatically When Approached

Hard-working hotel waiters, struggling through kitchen doors with heavily laden trays and performing like circus acrobats to make the passage safely, need no longer suffer from these agonizing evolutions for the photo-electric tube has come to the rescue. The General Electric Company has developed an automatic door-opener by means of which, without conscious human effort, a door can be made to open swiftly and silently, and to close in the same manner.

A ray of light focused on a photo-electric tube passes in front of the door. When this ray is interrupted it sets an hydraulic door-opener to work, through the agency of a photo-electric relay. The tube and light are placed several feet from the door and, as a person approaches, his body interrupts the light ray directed at the tube.—ELECTRICAL WEST, Aug. 1, 1930.

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Hot Closets & Platewarmers

A new line of Hewitt hot closets, made by the Hewitt Electric & Manufacturing Company, Arlington, Mass., provides a convenient and cleanly way of warming dishes before meals are served. In these closets or platewarmers, the finest china can be warmed without danger of cracking, according to the manufacturer, and food can be kept at a serving temperature without being dried out. The cabinets are double walled with asbestos insulation, and have sliding doors of bright polished stainless steel. Three heats are provided, and each cabinet is supplied with flush switch and pilot light. Two sizes are carried in stock; the model illustrated is 32 x 17 x 26 in.—ELECTRICAL WEST, July 1, 1930.

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Faucet Water Heater

"Hot Shot" is an electrical device manufactured by the Hot Shot Electric Water Heater Corporation, 520 North Michigan Ave., Chicago, for providing a hot water supply from a cold water faucet where there is no central heating system for the supply of hot water. It fits over the mouth of the water faucet and is plugged into the nearest convenience outlet by means of a cord attached to it. The water will run hot as long as the faucet is kept open, and no current is consumed when it is turned off. The device is easily removable and may be taken from one room to another. An adapter makes it usable on either round or oval faucets. Retail price, $12.50, postage paid; guaranteed for one year.—ELECTRICAL WEST, Aug. 1, 1930.

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600-Watt Flasher

An electric sign flasher plug which will operate up to 600 watts, a.c. or d.c., flashing from ten to fourteen times per minute and remaining "on" longer than "off," is announced by the Eagle Electric Manufacturing Company, 59 Hall St., Brooklyn, N. Y. —ELECTRICAL WEST, Aug. 1, 1930.

Refrigerator and Range

For small apartment house kitchenettes the Frigidaire Corporation, Dayton, Ohio, has developed an electric refrigerator and electric range combined, which occupies only a fraction more than 4 sq.ft of floor space.

Over-all dimensions of the combination, consisting of an oven-equipped electric range fitted snugly over the top of a small electric refrigerator, are 55¼ in. high by 26½ in. wide by 23 in. deep.

The cooking top of the range is at a convenient height, 43 in. above the floor. The oven, which is at the right of the cooking top, unless otherwise specified, is 12½ in. wide by 13½ in. high by 17 in. deep. The range is finished in gray and white porcelain.

The refrigerator, finished either in cream white duco or gray and white porcelain on steel, has a food storage capacity of 3 cu.ft. and a shelf space of 5½ sq.ft. Two ice trays, with a capacity of 24 cubes or 2½ lb. at a freezing, are provided.

Temperatures within the refrigerator are not affected by the heat of the range, according to the manufacturer, as 3 in. of special insulation separate the two.—ELECTRICAL WEST, Aug. 1, 1930.

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Wall-Type Heater

Style H-17 wall-type heater for use in bathrooms, sunrooms and other places which are hard to heat has been placed on the market by The Standard Electric Stove Company, 1718 North Twelfth St., Toledo, Ohio. Both convection and radiant heat are produced by the heater, which is completely insulated. The size of the box is 13⅛ x 18⅝ in., and the front is 17¾ x 20 in. The standard finish is white percelain; colors may be obtained at extra cost. A three-heat switch controls the heater, and wattage rating is 1,300 or 2,000 watts.—ELECTRICAL WEST, Aug. 1, 1930.

Everhot Water Heaters

To meet the demand for a hand-operated electric water heater that will supply hot water intermittently, delivering a small quantity of hot water in a few minutes' time, the Everhot Electric & Manufacturing Company, 116 Llewellyn St., Los Angeles, has designed a new line of electric water heaters equipped with either semi-automatic or full-automatic control.

The heating element of both the type "U" semi-automatic and type "UD" full-automatic heaters is placed beneath the tank, water circulates through the heater, and is delivered hot immediately at the top of the tank. The under-tank position of the heating element makes it possible so to insulate the heater and piping that the highest efficiency is obtained, according to the manufacturer. Four inches of rock wool insulation surround the tank, a return-bend heat trap is installed in the hot water line inside the insulation, the cold water line is connected at the bottom of the tank, and a brass tube with small openings enables the cold water to enter the tank with the minimum of agitation, or mixing of cold and hot water.

The semi-automatic type "U" heater is a hand-operated heater with a protective thermostat which opens the electric circuit when the full tank of water is heated, in case the operator should have neglected to turn the switch to the "off" position. The "UD" heater is equipped with a full-automatic thermostat to regulate the current supplied for a constant supply of hot water. This type is suitable for intermittent heating, or when desired, for continuous heating, the thermostat being equipped with an adjustable feature which enables the operator to provide hot water at any temperature from 135 to 175 deg. F. The heavy super-galvanized tanks of the heaters are finished in a durable and permanent lacquer, furnished in several attractive color combinations.—ELECTRICAL WEST, Aug. 1, 1930.

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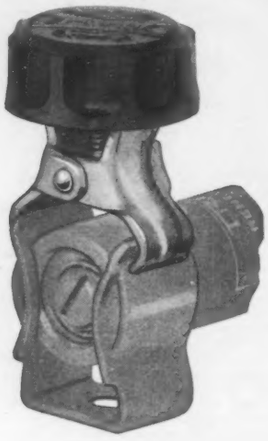
A NEW FEATURE has been added by the Clark Electric Water Heater Division of the McGraw Electric Company, Omaha, Neb., to its timer control clocks used for intermittent service on electric water heaters. Heretofore users of the timer control clock in connection with their water heaters had a limit of 60 minutes' use, at the expiration of which period the timer control clock discontinued the service and no more electricity was applied until the pointer of the clock was turned on again. The new feature permits of continuous automatic operation, if the pointer is turned to the space on the dial marked "Constant Contact."—ELECTRICAL WEST, July 1, 1930.

Clamp for Fuse Clips

"Kliplok," a clamp for fuse clips, is announced by the Trico Fuse Manufacturing Company, Milwaukee, Wis. Kliplok has a large safety knob of insulated material which permits easy and quick installation on live circuits; it can be adjusted and tightened with a simple twist. According to the manufacturer, this device clamps with a vise-like grip, locks the clips to the fuses, and thus assures pressure at contact. Kliplok is made in all sizes from 0 to 600 amp., both 250 and 600 volts to fit various styles of clips.—ELECTRICAL WEST, Aug. 1, 1930.



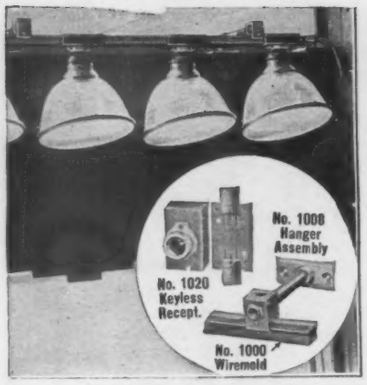
D.C. Radio Voltmeter

A new d.c. voltmeter, built especially for radio service work, is announced by the Jewell Electrical Instrument Company, 1650 Walnut St., Chicago.

The Pattern 89 voltmeter, as it is called, is a three-range instrument with scales of 30, 300,and 600 volts. The meter has a resistance of 1,000 ohms per volt in all ranges; consequently it shows the true voltage of the B power supply. The instrument is provided with a case of molded Bakelite; test leads and prods are furnished.—ELECTRICAL WEST, Aug. 1, 1930.

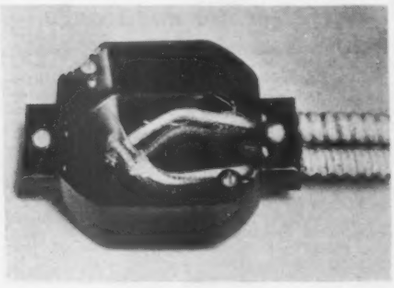
Fuse Puller

Easy to manipulate and designed to grip firmly with little pressure is a new fuse puller made of high dielectric horn fiber by the W. N Matthews Corporation, St. Louis, Mo. The tool is designed for pulling and replacing cartridge-type fuses from panel boards, opening or closing fuse switches which have cartridges mounted on the door, and many other uses where the operator needs a safe, insulated tool.—ELECTRICAL WEST, Aug. 1, 1930.



Window Lighting Outfit

A neat, inexpensive, easily installed show window lighting outfit for wiring both large and small show windows has been placed on the market by The Wiremold Company, Hartford, Conn. The outfit may be installed and assembled in the regular way with the use of Wiremold, as shown in the accompanying picture. It is designed to accommodate all standard make reflectors. —ELECTRICAL WEST, Aug. 1, 1930.



Outlet Box

A new type of outlet box known as the "Jay-Kay," with clamps on the outside instead of the inside, is announced by the All-Steel-Equip Company, Aurora, Ill. The box accommodates four leads of flexible metallic cable, and the "Jay-Kay" clamps eliminate the use of connectors. The cables, when fitted into place, are securely fastened by turning a single screw on each clamp. Clamps are fitted with peep-holes through which to locate the ABC bushing, and special shoulders on the clamp completely close the bushed holes when not in use.—ELECTRICAL WEST, Aug. 1, 1930.

Non-Magnetic Bus Fittings

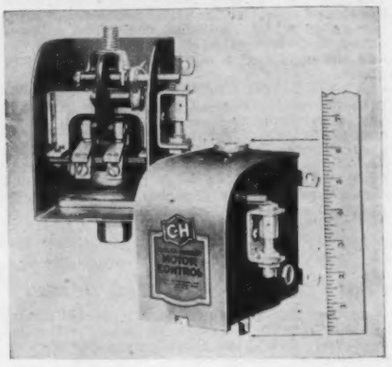
A new line of non-magnetic bus clamps and bus-support fittings is announced by the General Electric Company. The new fittings, which have exceptional mechanical strength, are made of non-magnetic steel with a circular ridge or raised portion located centrally on the face of the clamp. The circular ridge effectively transmits and distributes the clamping bolt pressure to the bus contact surfaces.

The design obviates the tendency of the bus bars to bow away from each other at the center when the clamps are tightened, causing loss of contact surface.—ELECTRICAL WEST, Aug. 1, 1930.

IMPROVEMENT IN LEATHER BELT MAKING —A unique type of flat leather belt making machinery has been developed by Graton & Knight Company, Worcester, Mass., in which the cement used is waterproof, extremely flexible, and has a very high heat crystalization point, enabling it to withstand frictional heat. Uniform adhesion in laps and plies, insuring continuous trouble-free operation, is a feature claimed for the product of the new machinery by the manufacturer.—ELECTRICAL WEST, Aug. 1, 1930.

Small Pressure Regulator

A new single-pole pressure regulator, exceptionally small in size, is announced by Cutler-Hammer, Inc., 153 12th St., Milwaukee, Wis. The device, designated as Bulletin No. 10,006, can be used as a starting switch for motors up to 1 hp., 230 volts, a.c. or d.c., or as a pilot switch in the control circuit of automatic starters for larger motors. The regulator closes the circuit at low pressure and opens it at high pressure. It can be adjusted to open the circuit at any pressure from 30 to 200 lb., and can be used for maintaining pressure on systems containing water, air, gas and other similar fluids. For air compressor service, a small unloader device at the side of the case removes back pressure.—ELECTRICAL WEST, July 1, 1930.



Westinghouse Safety Switches

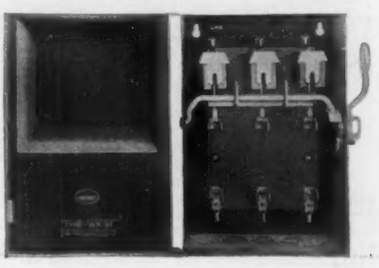
The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., announces a new line of quick-make and quick-break Type "C" safety switches designated as the Type WK-97, which conforms with the Underwriters' new test procedure.

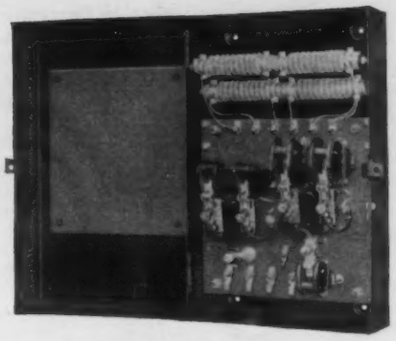
In the design of these switches a high degree of compactness has been achieved without the sacrifice of ample wiring room or sufficient voltage spacings.

The line incorporates the "De-ion" arc quencher on the 575-volt sizes. These quenchers, consisting of nickel-plated, slotted steel plates, held in place by insulating holders, are mounted individually over each jaw and are also easily removed from the front if it is desired to remove them for wiring.

All copper parts of the switch are removable from the front of the base. The jaws and connectors are of the one-piece formed type, which decreases the number of clamped contacts and eliminates any possibility of heating from this source. The diamond pointed break jaws and extended blades are features of this switch which assure clean contacts and prevent burning and beading of normal current carrying contact surfaces.

The operating mechanism is actuated by a compression spring which assures a positive quick make and quick break. The possibility of the spring breaking is very remote because of the large factor of safety used in its design. In case of a broken spring, external operation of the switch is possible and the broken spring will not come in contact with current carrying parts.—ELECTRICAL WEST, Aug. 1, 1930.





Lifting Magnet Controller

An automatic lifting magnet controller with an "automatic drop" arrangement is announced by Cutler-Hammer, Inc., 153 Twelfth St., Milwaukee, Wis. The automatic drop feature relieves the lifting magnet operator of an extra operation of the master switch each time the magnet is unloaded, giving him more time to operate the engine and brake levers and saving considerable time in loading and unloading.

The controller is fully inclosed to protect the operator against shock and flying particles, and the instrument against damage. The mechanism is mounted on an asbestos lumber panel which is moisture proof and withstands heavy shocks. Stationary mounting studs in the case facilitate removal and replacement of the panel opening the cover of the split-type enclosing case, allowing easy access and removal of all parts, including the resistor. The complete controller is small in size, yet provides ample space for pulling and connecting wires. Conduit knockout holes in the case facilitate wiring. The controller can be used with any make of magnet.—ELECTRICAL WEST, Aug. 1, 1930.

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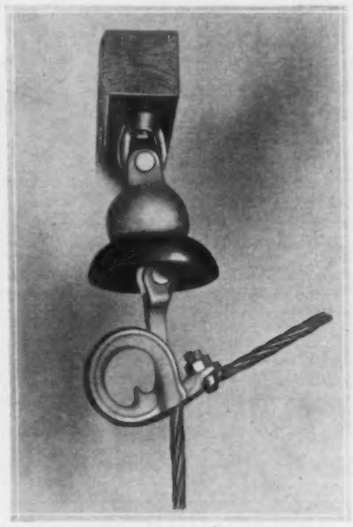

Dead-End Clamp

A light, strong, and economical dead-end clamp for farm lines, distribution circuits, substation buses, etc., has been developed by the Lapp Insulator Company, Inc., LeRoy, N. Y. This clamp is designed to take care of the entire range of conductor sizes frequently used for this work, making possible a reduction in warehouse stocks. In addition, the manufacturer points out that it appears well on the line, is easily installed, has few parts to adjust, and permits the conductor to be trained away to a pin-type insulator or other equipment.

Installation is simple since within the ring is provided a natural place for the hook of a block and tackle for pulling up the conductor exactly as desired, after which an easy bend and the tightening of two nuts completes the job.—ELECTRICAL WEST, Aug. 1, 1930.

Combustible Gas Indicator

An improved model U.C.C. combustible gas indicator for immediate detection of inflammable gases in manholes, especially where natural gas is used, has just been developed by the Union Carbide & Carbon Corporation, New York. An improved battery and a more detailed chart are incorporated in the new indicator.

E. D. Bullard Company, San Francisco, is co-distributor with the Union Carbide Sales Company of the instrument in the United States, Mexico, and Canada—ELECTRICAL WEST, Aug. 1, 1930.

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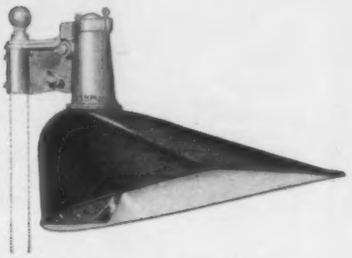


Duo-Service Floodlight

Combining a combination floodlighting projector and diffusing reflector, the Benjamin Electric Manufacturing Company, Des Plaines, Ill., has developed a new Duo-Service floodlight for floodlighting buildings and simultaneously lighting surrounding areas. It is recommended by the manufacturer for the uniform general illumination of any ground area with the simultaneous floodlighting of either a vertical or horizontal surface within or close to the ground area, or a horizontal surface at some distance from the general area. The loosening of the two screws in the top of the bracket cover and the two thumb screws in the hood cap allow the fixture to be disassembled for easy wiring.—ELECTRICAL WEST, Aug. 1, 1930.

Trade Literature

¶ TRAFFIC CONTROL—Traffic control systems of the Crouse-Hinds Company, Syracuse, N. Y., are given detailed description in three booklets recently issued by that company. One of these is devoted to the "Trafflex" control system for flexible-progressive control of traffic (Bulletin No. 2,212); another describes the company's fixed total period and adjustable total period automatic synchronous timing switches (Bulletin No. 2,209); and the third gives information on the "Trafilator" system of control which automatically adjusts itself to the ever-changing flow of traffic (Bulletin No. 2,207).

¶ FYNN-WEICHSEL MOTORS—A discussion of the problem of poor power factor, its cost, early attempts at power factor correction, and the application of the Fynn-Weichsel motor to its solution is contained in a bulletin being distributed by the Wagner Electric Corporation, 6400 Plymouth Ave., St. Louis, Mo. Constructional details and applications of the motor occupy part of the bulletin; another section is devoted to control equipment.

¶ "THE CITY WITH PLANNED STREET LIGHTING"—This is the title of a booklet describing the value of comprehensively planned street lighting recently published by the Holophane Company, Inc., 342 Madison Ave., New York. Illustrations and a description of the installation in a typical city where the program of planned lighting has been started, are included.

¶ ROAD SWEEPING MAGNETS—"Make America's Roads Safe for Motorists" is the title of a recent pamphlet of The Electric Controller & Manufacturing Company, Cleveland, Ohio. The publication describes the company's road sweeping magnets for installation on trucks for removing puncture-producing pieces of metal from roads traveled by automobiles.

¶ GENERAL ELECTRIC CATALOG—General Electric Catalog GEA-600A, superseding all previous catalogs issued by the company, with the exception of those dealing with railway, mine and industrial supplies and merchandise products, has been issued. The book contains 1,146 pages and is thumb-indexed in sixteen sections as follows: Generation, wire and cable, distribution transformers, arresters and capacitors, voltage regulators, switching equipment, switchgear, meters and instruments, lighting equipment, motors, motor applications, industrial control, transportation, industrial heating, miscellaneous and indexes.

¶ LIGHTING INSTALLATION PHOTO SERVICE—A plan whereby representatives of the Benjamin Electric Manufacturing Company, Des Plaines, Ill., distributors and central station lighting men are authorized to place orders locally with photographers in the larger cites of the country for the photographing of Benjamin lighting installations, is described in a leaflet issued recently by the Benjamin company.

¶ ELECTRIC RANGE SALES MANUAL—A handy pocket-size sales manual for distribution to dealers, jobbers and delears' salesmen has been issued by The Standard Electric Stove Company, Toledo, Ohio. Chapters in the manual on such subjects as "The Market for Electric Ranges," "Advantages of Electric Cooking," etc., make of it an educational treatise on the whole subject of cooking electrically.

¶ A METAL FOR OUTDOOR ELECTRICAL INSTALLATIONS — "Duronze," a silicon bronze alloy recently developed by the Bridgeport Brass Company, Bridgeport, Conn., is the subject of a booklet issued by that company setting forth the properties of this metal which "possesses great strength, malleability, toughness, resistance to chemical and atmospheric corrosion, and immunity from season cracking."

¶ SAFETY CATALOG—E. D. Bullard Company, San Francisco, manufacturers of safety equipment and material, has published Catalog No. 30 entitled "Everything in Safety." Working information is given in the catalog in addition to illustrated description of an assortment of safety material and equipment for all industries.

¶ INDUCTION MOTORS — Fully-enclosed, fan-cooled induction motors Type AA, Form F, for 2- and 3-phase a.c. circuits, manufactured by the Reliance Electric & Engineering Company, Ivanhoe Road, Cleveland, Ohio, are listed and described in the company's Bulletin No. 107. A table of ratings and a dimension sheet are included.

¶ INSULATED WIRES AND CABLES—Bulletin No. 10 just issued by the Rockbestos Products Corporation, New Haven, Conn., gives construction specifications and applications of Rockbestos insulated wires and cables for use in power companies and industrial plants wherever wiring is exposed to heat, moisture, fumes, acids, vapors, oil or grease.

¶ VERTICAL BREAK SWITCHES—"MA-39" vertical break, gang operated switches for line and outdoor substation service are described and listed in Bulletin No. 39-A just issued by the Delta-Star Electric Company, 2400 Block, Chicago. Complete dimensions and installation data are given.

¶ COLOR LIGHTING ACCESSORIES—Hoods plates and cylinders employing natural color glass for various indoor and outdoor lighting needs are described in Bulletin No. 80 recently issued by Reynolds Electric Company, 2650 West Congress St., Chicago.

¶ VENTILATOR INSTALLATION — Detailed instruction for installing its Electrovent and facts relating to the fundamental principles of ventilation are given in a folder issued recently by the Electrovent Corporation, 5057 Woodward Ave, Detroit, Mich.

¶ EVAPORATORS—The functions, applications and advantages of evaporators for distilling boiler-feed make-up water are discussed in a bulletin (No. 361) recently issued by The Griscom-Russell Company, 285 Madison Ave., New York

¶ WIRE TABLES—Revised wire tables for Copperweld wires and strands have been issued and are being distributed by the Copperweld Steel Company, Glassport, Pa.

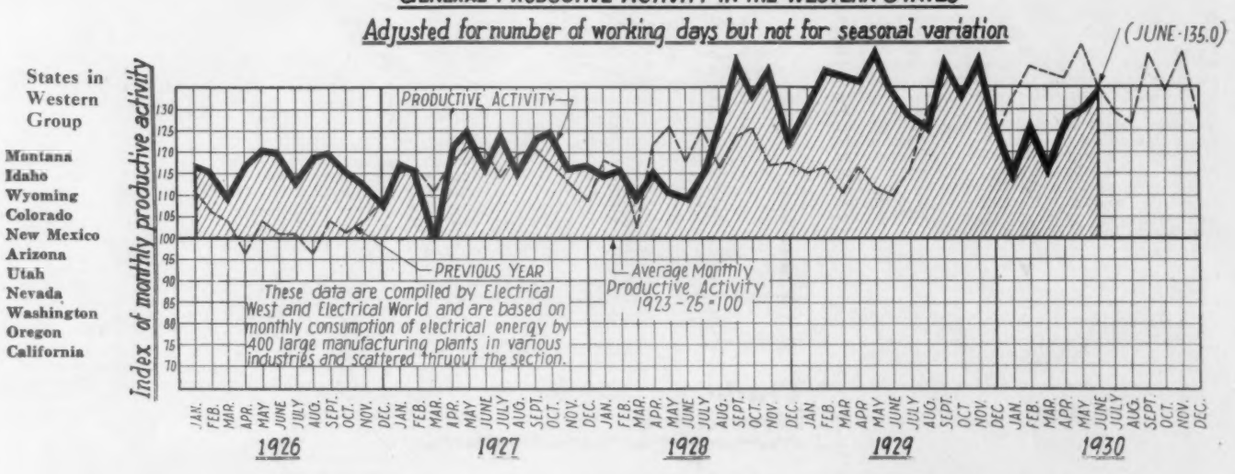
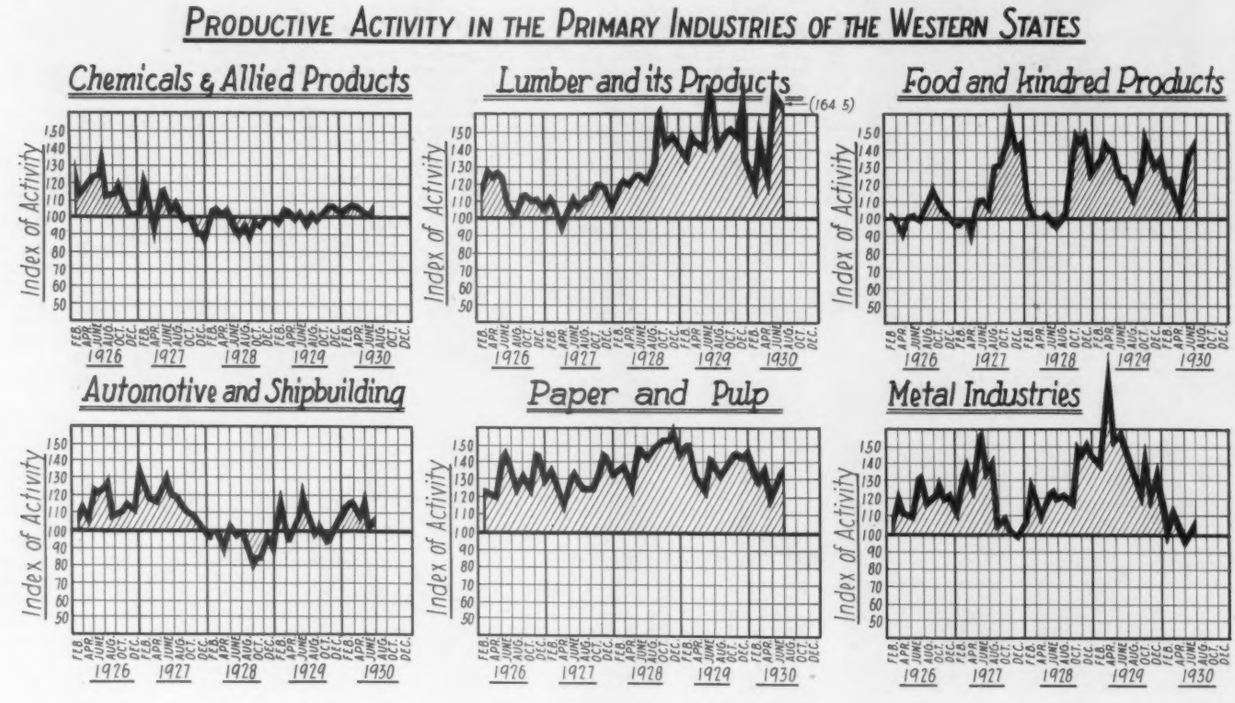
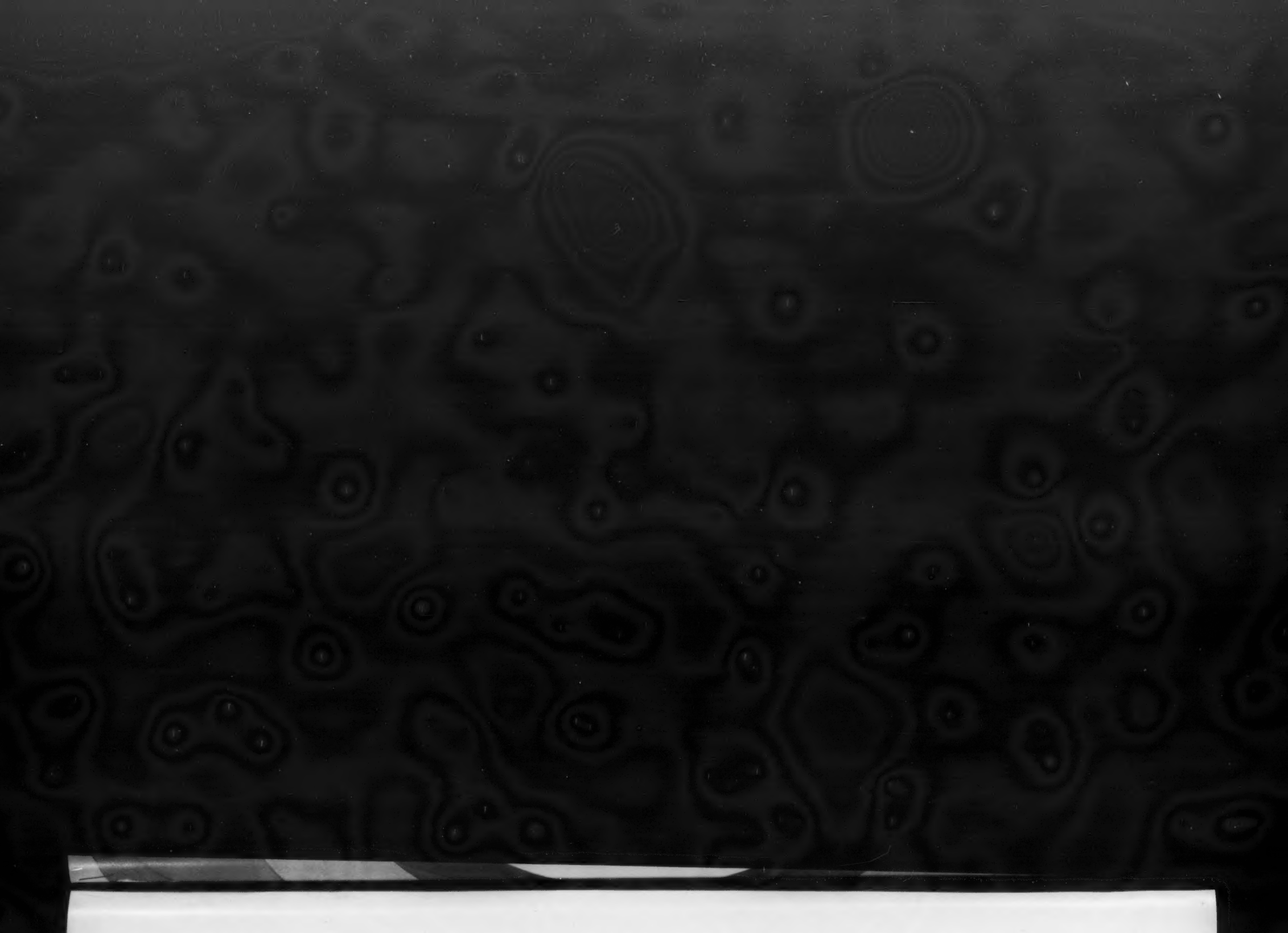
Barometer

The West is the only section of the country which is witnessing a decided upward trend in general manufacturing. Since the low point in manufacturing operations in this section was recorded in February the upward trend has been continuous, until the June activity was at a rate 15 per cent above that of February. The average rate of activity during the first six-month period of this year, however, was 9 per cent under that during the same period in 1929, but was 12 per cent above the average rate of manufacturing activity during the first six months of 1928.

Consumption of electrical energy for power purposes by some 400 large manufacturing plants operating in the Western states indicates that the June rate of operations was 3.5 per cent above May, and was 0.6 per cent above June last year. This is the first time since last December that manufacturing operations in this section have exceeded those of the same month of the year previous.

Every industrial group in the section with the exception of two—forest products and rubber products—reported June operations above those of May. Four manufacturing groups—metals, paper and pulp, rubber products, and stone, clay and glass—witnessed a volume of June manufacturing above that reported for June, 1929.

Indexes of Industrial Activity in the Western States

(All figures adjusted for number of working days)

	June 1930	May 1930	June 1929	Average 1st Half 1930	Average 1st Half 1929
All industry	135.0	130.5	134.2	125.5	137.8
Chemical and allied products	109.7	102.9	91.2	107.1	96.9
Food and kindred products	147.5	141.4	121.5	131.2	136.2
Forest products	164.5	169.2	161.0	153.1	155.5
Metals group	108.5	99.5	134.1	103.5	160.5
Paper and pulp	138.5	132.2	142.0	133.6	142.9
Rubber and its products	168.0	180.0	197.0	169.2	198.9
Shipbuilding	109.3	106.3	99.7	113.8	107.6
Stone, clay and glass	113.8	94.9	167.0	100.2	140.7